Navy Personnel Research and Development Center
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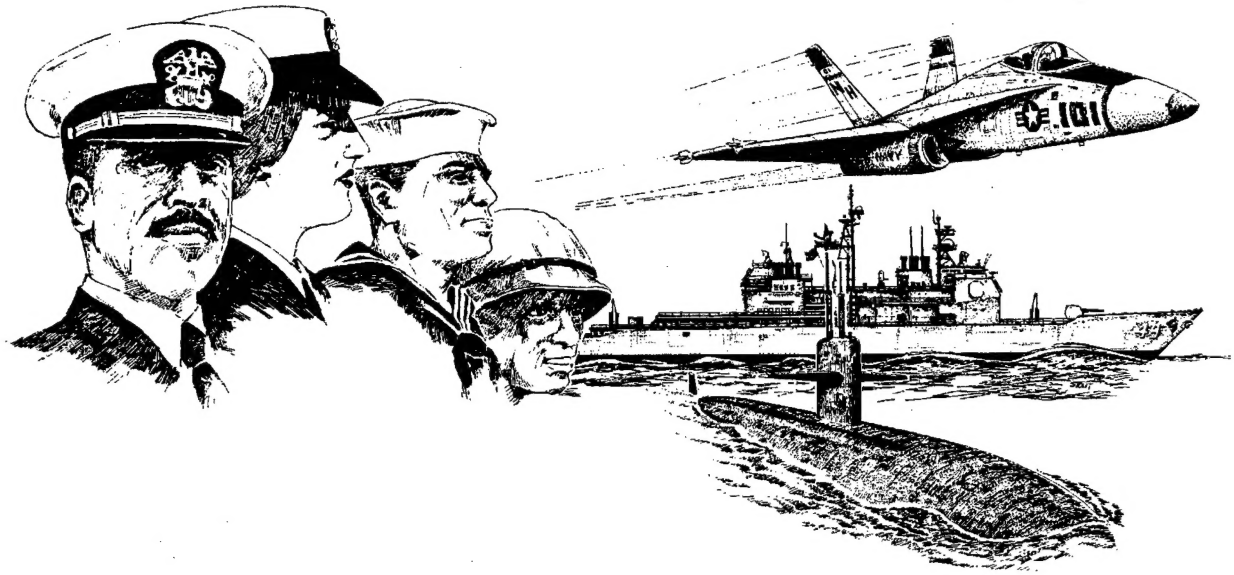

VOICES FROM THE PAST—COMMAND HISTORY POST WWII TO NOVEMBER 1999

AN HISTORICAL ACCOUNT OF THE NAVY PERSONNEL RESEARCH & DEVELOPMENT CENTER (NPRDC) OF SAN DIEGO, CALIFORNIA

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Reviewed and approved by
Norma Zaske

Released by
William M. Keeney
Commander, U.S. Navy
Commanding Officer
and
Murray W. Rowe
Technical Director

Compiled by
Edmund D. Thomas
Ted M. Yellen
Sam J. Polese

Navy Personnel Research and Development Center
53335 Ryne Road
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This report summarizes the history of the Navy Personnel Research and Development Center from its founding in July 1973 through its disestablishment in November 1999. Over its lifetime the Center conducted over 800 separate research and development projects supporting the Navy and Marine Corps. NPRDC's core R&D functions in manpower and personnel were assumed by the Navy Personnel Research, Studies and Technology (NPRST) division of the Navy Personnel Command, Millington, Tennessee, which began operations in November 1999. The new research center carries with it a rich legacy of achievements from its predecessor organization. This report highlights a selection of these products and describes NPRDC's corporate history in terms of Commanding Officers, Technical Directors, organization, resources, R&D programs, and recognition for performance.

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NPRDC's Eleven Barracks Buildings on Point Loma (Circa 1975).

FOREWORD

The Navy Personnel Research and Development Center (NPRDC) in San Diego, California was the outgrowth of two people-related research and development (R&D) laboratories established by the Navy in the 1950s. The Center begin operations in July 1973 as a centralized organization for managing, coordinating, and conducting R&D in the areas of Manpower, Personnel, Training, and Human Factors Engineering. The Human Factors Engineering component was transferred to another R&D laboratory in the late 1980s.

In 1995, the Base Realignment and Closure Commission (BRAC-IV) recommended that NPRDC be "disestablished and its functions realigned." In line with that directive, the Center's training research mission was transferred to the Naval Air Warfare Center Training Systems Division (NAWCTSD), Orlando Florida, on 1 February 1998. A new department within the Navy Personnel Command (NPC) in Millington, Tennessee assumed the remaining functions for Manpower and Personnel R&D. This Navy Personnel Research Studies and Technology (NPRST) organization assumed those responsibilities on 7 November 1999.

The technical reports, official documents, and annual research summaries used in preparing this report each yielded unique and different perspectives of an organization that passed through its own stages of infancy, childhood and eventual maturation as a unique Navy R&D laboratory. Our review of these documents led us to conclude that two histories were needed: one detailing NPRDC's corporate--or administrative--history, and another describing its technical contributions and accomplishments.

Compiling an organization's history near the end of its lifetime is at best akin to attempting to assemble a picture puzzle that is missing several pieces. We apologize in advance for any serious omissions or facts we may have overlooked in this presentation.

We are indebted to several individuals who contributed additional information and insights regarding the Center's history. Mr. Bob Turney compiled the archival documents we referenced for this report. He helped establish the San Diego laboratory and served as NPRDC's historian over most of its lifetime. His inputs and comments were invaluable in writing this report. Two former Technical Directors, Mr. Gene Ramras, and Dr. Jim Regan, contributed their memories and personal experiences about NPRDC's formative years, while Mr. Bob Thorpe assisted us in organizing our notes and developing the presentation. We also are indebted to four reviewers, Drew and Marjorie Sands, Tom Blanco, and Joe Silverman, who helped to fill in omissions and "keep us honest" about various details of this history.

Edmund Thomas
Ted Yellen
Sam Polese

October 1999

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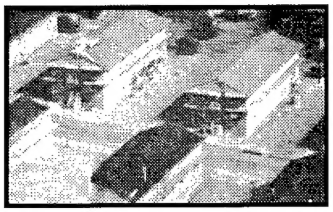
PART I: NPRDC'S ADMINISTRATIVE HISTORY



"We visited the Point Loma area and saw a number of old barracks buildings (where the Center was located). The Captain said, 'Kid, who owns those?' and I said, 'I think the Coast Guard or the Army, I don't know.' We stopped at the Naval Electronics Laboratory...They just had a small building then...and he found that the Commanding Officer of the Naval Electronics Laboratory was a friend of his by the name of Captain Dundas Tucker and he owned those barracks buildings. So Captain Van Swearingen said, 'Give the kid a couple of buildings...' I can't remember for sure the building numbers, but I believe 328 was the first one and 329 the second one." [Capt. E. Van Swearingen, 1951]

LCDR William Martin
Assistant Officer-in-Charge
Naval Personnel Research Unit

Post WWII Roots

The Navy Personnel Research and Development Center's (NPRDC) organizational roots go back to 1946 when the Bureau of Naval Personnel (BUPERS) formed a Personnel Research Division to continue personnel research work conducted during World War II.

With the outbreak of war, the Navy experienced an enormous influx of personnel, expanding from a peacetime level of 100,000 men to 3.5 million by war's end (a 3,000 percent increase in just six years). This unprecedented increase in manpower greatly taxed existing selection, classification, and training procedures. David G. "George" Price, one of the pioneers of the Navy's personnel research program in BUPERS, provided this insight on the value of selection tests:

"Officer classification tests were developed by psychologists and education specialists based on job analyses. Tests were developed based on job descriptions of PT boat skippers or amphibious boat operators, etc. There was a very high correlation, for example, between the classification test scores for skippers of small amphibious craft and their score on the spatial relations part of the test. The officers, who were constantly banging ships into the docks or didn't get close to the docks, normally scored relatively low on the spatial relations part of those tests. That program really was just getting underway when the war ended."

In 1946, the Chief of Naval Personnel combined personnel research into one division, initially calling it the Personnel Analysis Division and later changing the name to the Personnel Research Division. CAPT E. Van Swearingen, then Director of the Personnel Research Division in BUPERS was responsible for the change.

According to George Price, some of the Captain's associates told him that the term personnel analysis had the connotation of military personnel stretched out on a couch undergoing psychoanalysis. Since this is not what we did, he felt we should change the name of the Division. We found out that the name Research Division had more respectability in the R&D community and helped us in our funding.

CAPT Swearingen also changed the name of our enlisted classification system from Navy Job Classification System to Navy Enlisted Classification System (NEC). The significance of this change was that in our dealing with the DoD we could indicate that the term "job" was a very small segment of a man's rating or classification and not an entity that related to an Army MOS or Air Force AFS.

The first field organization was the San Diego activity, which grew out of a field team of military personnel conducting occupational analysis onboard ships in the San Diego area. Under the direction of LCDR William Martin, USNR, the team was working in office space in the old Fox Theatre building in downtown San Diego.

". . .Give the kid a couple of buildings."

Bob Turney

According to CDR Bob Turney[1] (USN, Ret), "In March 1951, CAPT E. Van Swearingen, and I came out from PERS 15 to see if we could find better quarters for Bill Martin and his unit." CAPT Swearingen, Bob Turney, and Bill Martin visited the Point Loma area and saw a number of old barracks buildings (where NPRDC is now located). CAPT Van Swearingen discovered that the Naval Electronics Laboratory owned these buildings and that it's commanding officer, CAPT Dundas Tucker, was a personal friend. So, CAPT Swearingen asked CAPT Tucker to "give the kid a couple of buildings." LCDR Martin, Turney, and CAPT Swearingen picked out two buildings. In June 1951 Bob Turney returned to San Diego and spent six weeks overseeing the renovation of the buildings into office spaces. These became the new home of the Navy Personnel Research Unit, San Diego.

Sometime later, the Unit was given 40 ceiling points for civilian personnel. Position descriptions were prepared and, as a result, 25 civilian employees were brought aboard. According to LCDR Martin, "Bob Turney, who was our sea daddy in Washington at the time, was able to get some funding, and we procured enough furniture to outfit two barracks buildings with typewriters and office equipment." The research activity embarked on research in personnel and training.

The first Officer in Charge was CAPT William Lowery, with LCDR Martin as Assistant Officer in Charge and Dr. Edwin Dudek as the first Technical Director. Dr. Earl Jones succeeded Dr. Dudek and served in that capacity until the Washington and San Diego organizations were closed and NPRDC was established in 1973.

The San Diego activity's training research facility was the largest single entity in the Navy concerned with the problems relating to training research and development. According to Dr. Jones,

"During the late 50's and early 60's, then very strongly in the mid-60's, programs were developed to exploit computers in training and education. The San Diego research activity was the first in the military to use computers for educational training purposes. It has the first set of major projects that led to what is now called computer-managed instruction. Those programs are really the forerunners of what have become very major programs."

In 1969, the San Diego Activity was designated as the Naval Personnel and Training Research Laboratory to reflect an increased R&D emphasis on training.

Meanwhile, in Washington, D.C.

The Washington research laboratory was established with a nucleus of BUPERS analysts. These were individuals who had been on loan to DoD for a military occupational classification project and returned to BUPERS in 1951. It was decided to keep them in a group where their specialized knowledge would continue to benefit the Navy.

In July 1952 the secretary of the Navy established the U.S. Naval Personnel Research Field Activity, Washington, under the management control of the Chief of Naval Personnel. The new Activity had a staff of 43 civilians and 36 officers, and was under the direction of an Officer in Charge. The new Activity's efforts focused on classification research and developing qualifications for advancement in rating. There were also projects in career guidance and literacy requirements for Navy jobs.

In 1957, a small group from the DC Activity was asked to work on a new program, which was ultimately called the New Developments Program. This group was assigned to the Navy's Special Projects Office, set up under VADM W. Rayburn (considered the father of the Polaris System) to develop the Polaris Fleet Ballistic Missile Program. VADM Rayburn requested a team of experienced people to develop personnel and training requirements for the new system concurrent with the development of the hardware.

The initial project determined the personnel and training requirements for USS OBSERVATION ISLAND, a test ship for the FBM Polaris. This effort successfully demonstrated the importance of considering manning factors at the same time a system was being developed. As a result, this program was expanded. The name was later changed to the Man/Machine Systems Department (with a staff of about 80 people).

[1] In 1951, Robert F. Turney was a Naval Officer assigned to BUPERS. He played a major role in establishing the Personnel Research Unit in San Diego. After his retirement he came to NPRDC in 1975 and worked in a civilian capacity as a Military Personnel Research Specialist. Among his many duties, he was the Command Historian. He retired again in 1992, but continued to work at the Center as a member of the Emeritus Program. The historical files we relied on in developing this report are a product of his belief that records of the past can provide helpful information for the present and future.

In 1961, SECNAV redesignated the Washington Field Activity, changing its name to U.S. Naval Personnel Research Activity. By January 1962, the Washington Activity was in its permanent quarters in Building 200 of the Naval Weapons Plant (commonly known as the Washington Navy Yard).

The Washington Activity was designated as the Personnel Research Laboratory in April 1964. The position of Chief Scientist was changed to Technical Director and, in July 1964, Dr. George G. Burgess assumed that position. In September 1967, Mr. E. M. Ramras succeeded Dr. Burgess as Technical Director and remained in that position until the disestablishment of the Washington Laboratory in 1973. In December 1968, the Washington Laboratory was renamed the Naval Personnel Research and Development Laboratory. The majority of its efforts involved occupational research and manpower development.

At that time both the San Diego and Washington laboratories reported to the Personnel Research Division (Pers-15/Pers-A) of the Bureau of Naval Personnel. The Division was staffed by six to eight professionals who coordinated the efforts of the two labs, identified research requirements, and served as the R&D liaison between the labs and BUPERS program managers. Both the Washington and San Diego labs had developed their own sets of clients and sponsors and each was addressing recognized Navy needs and requirements, albeit through different avenues.

Over time, it became apparent that the two labs were often engaged in similar research and were not aware of it. At the same time, the Washington lab found it was responding to a growing number of quick-response requests from headquarters, which detracted from its ability to conduct longer-term research.

Lastly, the late '60s also brought continuing pressures, particularly from Congress, to reduce the number of military activities in the National Capital region. The Washington Laboratory, not being a headquarters activity, was a frequently discussed target for relocation. This led to discussions between Pers-A3 and the Washington Laboratory concerning a possible move from the Washington DC area.

Several alternate locations were suggested, including sites in Florida, Maryland, New Jersey and Michigan. It isn't clear who first suggested that an alternative to relocation would be in consolidating the two Labs in San Diego. As Mr. Ramras would later recall, *"Why don't we consolidate in San Diego? It is a logical choice, close to the operating forces, and San Diego is certainly a location that would be an attractive place for recruiting high quality researchers."*

NPRDC, San Diego is Born

In May 1973, the Secretary of the Navy approved the establishment of the Navy Personnel Research and Development Center, and the Center began operations on 1 July that year. The new Center occupied the same 11 buildings at the Pt. Loma location that had housed the San Diego Laboratory. The Center also had satellite offices in Washington, Norfolk, Pensacola and Memphis (See Figure 1.). CAPT Frederick L. Nelson was the first Commanding Officer while Mr. Ramras served as the interim Technical Director.

NPRDC's mission was to serve as the principal Navy RDT&E organization for advancing and applying those sciences and technologies required to support operational and research requirements in manpower, education, and training, and serve as the coordinating organization for all RDT&E conducted in support of these requirements. The latter *coordinating* phrase refers to the fact that Pers-A3's functions were also embodied in the Center's charter.

Of the 230 people at the Washington Lab and Bureau at the time of decommissioning, about 30 relocated in San Diego. The rest resigned, retired, or found jobs in other agencies in the DC area. The new Center's manpower authorization was 262 civilian personnel, seven officers, and 19 enlisted personnel. The staff included psychologists, statisticians, systems analysts, mathematicians, instructional technologists, computer programmers, economists, and others.

The new Center's 'master plan' called for 12 separate programs, each having its own charter. During its first year, designated/acting heads for each of these programs worked with their new teams to create a unifying umbrella or charter for their program area. The process of charter development was iterative over several rounds. Members of the Naval Research Advisory Committee (NRAC) served as both advisors and reviewers for the 12 emerging R&D programs.[2]

At a practical level, funding remained an issue. While 12 program areas might ultimately cover the broad spectrum of R&D for the new Center, not all were equally funded (if at all).

[2] The Naval Research Advisory Committee (NRAC) was supported through the Office of Naval Research. NRAC members were from academic institutions and were generally recognized as being preeminent in their respective behavioral science fields.

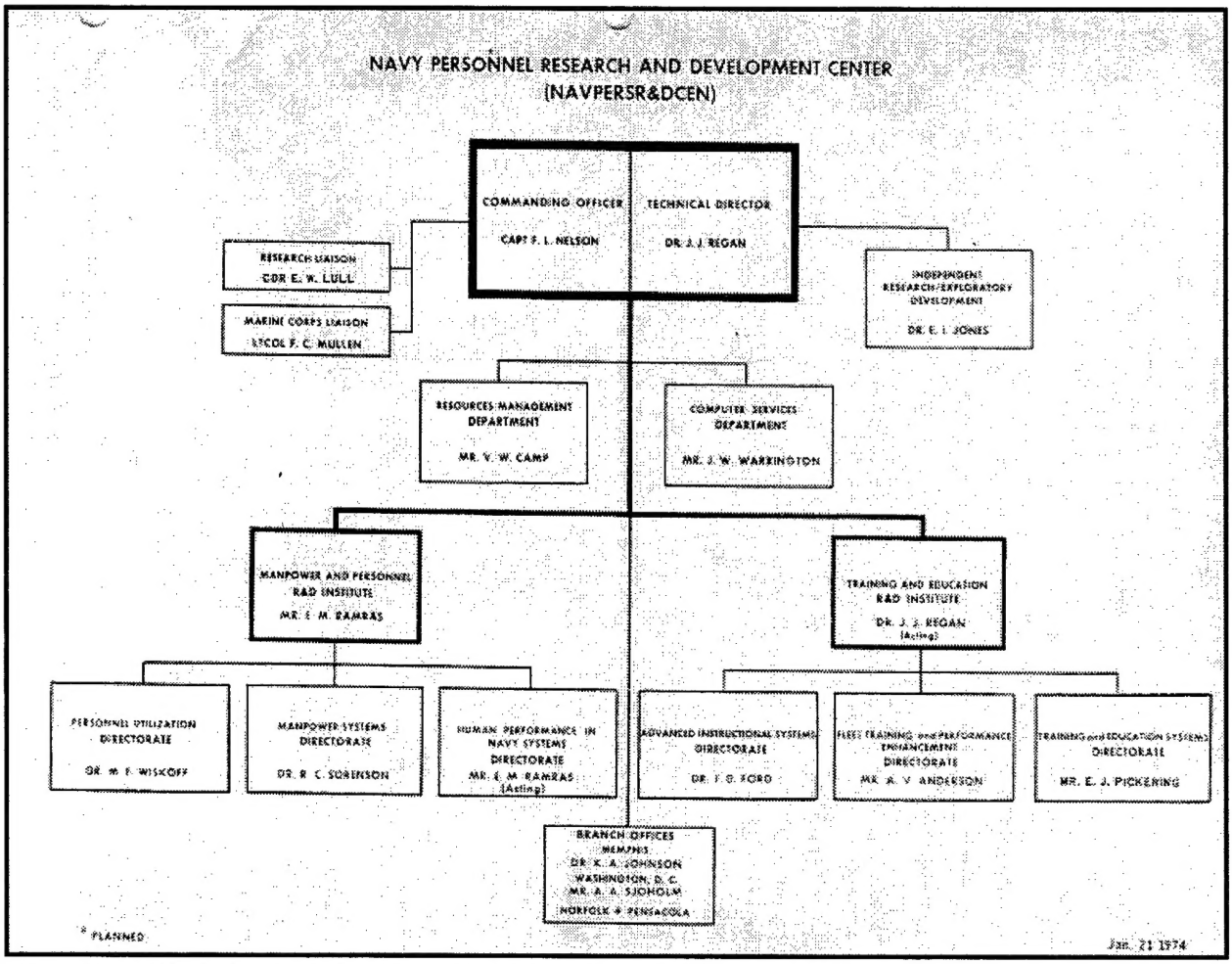


Figure 1. NAVPERSRANDCEN Organizational Chart of January 21, 1974.

Dr. James Regan reported to NPRDC in September 1973 as the new Technical Director. He indicated *" . . . it involved getting to know a whole new cast of characters, beginning with all of the people here, of course. In addition we had to begin an active recruiting program to acquire the additional 100 people for which we had billets."*

New NPRDC TD, Dr. James Regan, addresses Center employees. Behind him are seated RADM G.E.R. Kinnear, II (left) and CAPT F. L. Nelson, the Center's Commanding Officer.

NPRDC's Overall Management Realignment

In 1975, the headquarters management of NPRDC was changed from BUPERS to the Chief of Naval Material. CAPT James J. Clarkin, Commanding Officer of the Center at that time, indicated the basis for the change (See Figure 2). *"This goes back to the establishment of the Center and its role . . . A continuation of the Center under BUPERS meant that the Center would be widely perceived as limited in its role to those issues under the purview of the Chief of Naval Personnel and this was certainly not consistent with our mission. It was decided that, in order to accomplish our mission, the Center should come under the Director of Naval Laboratories, who was an agent under the Chief of Naval Material. There seemed to be a great logic in having a scientific organization housed with our principal R&D scientific operations."*

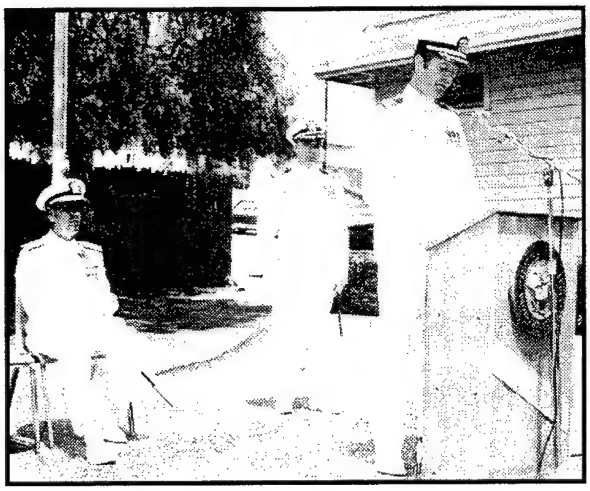


Figure 2. CAPT J. J. Clarkin assumed command of NPRDC in July 1974. RADM R. Freeman, III (Seated) and CAPT F. Nelson, NPRDC's former CO listen as he addresses the Center's employees.

Dr. Regan outlined NPRDC's R&D capabilities with the following, " . . .*The list of pressures, constraints, adverse trends, and dangers that the Navy must surmount goes on and on—with many of these difficulties centering squarely on issues of manpower, personnel, education, and training. This is the designated area of mission responsibility for the Navy Personnel Research and Development Center. It is an area in which the Center has developed a potent expertise for solving long-term and short-term management and operational problems. Our R&D program represents the most comprehensive and effective system the Navy now has for developing the technology needed to improve the acquisition process; to design more effective training programs (at less cost); to optimize personnel management, planning, and compensation; to increase productivity; to improve morale; and to combat the attrition that is weakening our operational forces."*

Expanding the Center's Capabilities

During its initial years of operation, it became apparent that the Center's R&D program would be enhanced by three new functions: (1) greater emphasis on applications support and technology transfer; (2) the capability to conduct quick-response studies in response to management requests; and, (3) greater interface with the fleet. These additional functions became realities in 1976.

To facilitate the introduction of RDT&E end products into operational use, NPRDC established an Applications Support Office in FY76. This new office was designed to improve the relationship between researchers, sponsors, and users of end products. It was aimed at improving coordination from the initial problem identification through the final development and implementation of a product.

The Center also established a studies and analysis group in FY76 whose purpose was to: (1) carry out analytical studies of a quick-response, short-term nature and (2) provide specific information and technical assistance for urgent Navy, Marine Corps and DoD requirements. NPRDC's over-riding concern was to organize and staff the program to carry out the required studies while ensuring an active interface with the Center's R&D programs.

Another area of expansion was in fleet support. The Navy Science Assistance Program (NSAP) provided one vehicle through which fleet problems could be identified. NSAP science advisors at various fleet commands and NSAP coordinators at other R&D laboratories helped identify near-term fleet problems appropriate to NPRDC's mission and capabilities. In the fall of 1976, the Center hosted an NSAP meeting, attended by program field representatives, science advisors and coordinators, and Washington headquarters NSAP managers. The meeting reviewed fleet experiences and problems, and conducted workshops aimed at improving fleet services.

By the end of 1976 NPRDC's Technology Transfer (T^2) efforts were extended to all phases of disseminating information, providing technological assistance, and actively participating in presentations and meetings. The Center was also designated as the CONTACT (Contacts for Technological Area Coordination) laboratory to serve as a clearinghouse for human resources technology. NPRDC responded to many requests for information from a variety of local, state, and national agencies and was represented at more than a dozen T^2 presentations, meetings, and workshops in California and Hawaii.

In the early days of NPRDC, the Center's Computer Support Department housed an IBM 4341 computer and was staffed with personnel who assisted the Center's researchers in designing, developing, and executing computer programs for data processing and statistical analysis. The Center also used several mini- and microcomputers to support specific R&D projects.

Research facilities available to support R&D in all of the Center's lead product areas included:

- TRAINING AND TESTING RESEARCH FACILITY—Served cognitive and computer scientists whose thrusts were artificial intelligence, cognitive science, computer-aided instruction, computerized adaptive testing, and expert systems.

- SYSTEM SIMULATION FACILITY—Served experimental and cognitive psychologists and human factors engineers who were concerned with the measurement of human performance, human factors in command system design, operations research, systems analysis, and training embedded in operational systems. It included equipment for biopsychological and psychophysiological measurement.
- PRODUCTIVITY AND INCENTIVE MEASUREMENT FACILITY—Served social and industrial/organizational psychologists and management experts whose objective was the controlled measurement of human performance under various incentive packages and motivational programs.
- MANPOWER AND PERSONNEL DATA BASE FACILITY—Served operations researchers, systems analysts, and personnel research psychologists whose activities required examination, manipulation, and analysis of data resident in large data bases, such as data on military personnel and military organizations.

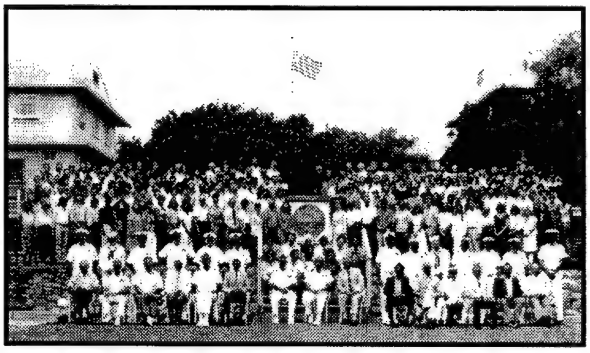
NPRDC also conducted R&D at sites away from the Center such as Navy schools, industrial facilities, and at dockside. This capability was facilitated by two vans that were equipped for experimentation and testing. These mobile laboratories were easily configured to meet the needs of specific projects. Video and photographic equipment were also available for project-related use off-station as well as on-station.

Equal Employment Opportunity Program

The Center had an effective and productive Equal Employment Opportunity (EEO) Program which fully supported Federal policies of EEO. The Deputy EEO officer was a civilian who reported directly to the Commanding Officer.

Management of the programs was through an extremely active EEO Committee made up of dedicated volunteers from among the Center's employees. They were supplemented by several volunteer counselors for the Federal Women's Program, the Hispanic Employment Program, the Handicappted/Disabled Veterans Program, Upward Mobility Program, and Civilian Employee Assistant Counseling Services Program. The Center also established an EEO Excellence Award which was given annually to an employee who made outstanding contributions that furthered EEO principles.

One indicator of the Center's EEO Program effectiveness was winning the Chief of Naval Material's "EEO Excellence Award," and a Bureau of Naval Personnel Inspector General Report which commended NPRDC for its "outstanding EEO Program, which was extremely well structured, visable, and dynamic."



NPRDC Employee Group Picture, 1982

Community Relations

Since NPRDC's R&D program was concerned with people-related problems, it was only natural that many of its efforts impacted the local community and that many employees participated in community activities. For example, in FY77, NPRDC formed a speaker's bureau to provide liaison between community and Center personnel who were willing to address school, civic, and professional groups.

Center employees also participated in the Navy Tutorial Program, which was directed at assisting students who needed help in English, mathematics, science, and basic study skills. Volunteers donated several hours each week of their own time to assist students with special needs—usually on a one-to-one basis.

The Center adopted Pacific Beach Middle School as its Partner in Education—a broad program that included student tutoring, school presentations, and donations of surplus equipment to the school. Teachers also visited the Center to learn about our research programs and capabilities.

The Center's Applied Psychobiology Program also provided opportunities for community involvement. For example, researchers in this area lent their assistance to national organizations devoted to helping autistic children, and the Center's neuroscience equipment was used to determine how the autistic child's brain processes incoming visual and auditory information. Dr. Bernard Rimland, one of the Center's Senior Scientists, on retirement, continued much of this forefront research as the founder and president of the Autism Research Institute.

NPRDC was also a member of the California Consortium of Federal Laboratories. The Consortium was chartered to identify military R&D products that could be applied to solving problems in the civilian sector. An area of particular concern involved social and human resource problems within city and country governments. Toward this end, the Center loaned the services of Mr. Allan Sjoholm, one of its senior scientists, to the City and County of San Diego for a period of two years. During that time Mr. Sjoholm served as a liaison and technology transfer agent for these government bodies.

Center employees also made presentations on their research programs to local universities, and served as faculty members at these universities. Over its lifetime the Center received several awards from professional organizations, including the American Psychological Association (APA). In 1999, the Military Psychology Division of APA presented its annual award for outstanding contributions to James, McBride, W.A. "Drew" Sands, and Brian K. Waters. They were cited for this long history of achievements in the development and application of computerized adaptive testing (CAT) in the military and recent publication of a book on the subject.

Realignments

In May 1985, the Secretary of the Navy, John Lehman, abolished the Office of the Chief of Naval Material. The functions and resources of the Center were transferred to the management control of the Chief of Naval Research. NPRDC's tenure under the Chief of Naval Research was relatively short, lasting from May 1985 until February 1986. In February 1986, Secretary Lehman transferred NPRDC together with eight other Navy R&D Centers to the management control of the Commander, Naval Space and Naval Warfare Systems Command (COMSPAWARSYSCOM).

Secretary Lehman said that the rationale for reassigning NPRDC to SPAWARS was that it would align the organization more appropriately to the systems commands material and technical support organization. This alignment would also provide more efficient administration and system integration of the R&D Centers' technical support operations under the Navy's top-level systems engineering command. He also added that efficiencies and improved span of control would be realized with the transfer.

NPRDC Ordered Closed

In the beginning months of 1987 the Center was dealt a shocking blow when Secretary Lehman, before resigning his government position, signed, among many other things, an order to close NPRDC, effective with the end of FY87. Needless to say, this act created a furor at several levels of the Navy, not the least of which was NPRDC.

A number of Flag Officers as well as four San Diego area U.S. Congressman sent letters to the newly appointed Secretary of the Navy, James H. Webb, urging him to save NPRDC. After due consideration, Webb reversed Lehman's order subject to a comprehensive review by the Navy. The Chief of Naval Operations, Admiral A. H. Trost, endorsed this review in his request to the Secretary of the Navy.

According to Rep. Bill Lowery, R-San Diego, *"Webb is the only one who had the power to reverse the order . . . Webb obviously took the time to consider and analyze the important work performed at the facility."*

"Are We Getting What We Need?"

As a follow-up to ADM Trost's suggestion, COMSPAWARSYSCOM (VADM Glenwood Clark) directed that a comprehensive review be made of NPRDC. The review was to include the Center's mission, R&D programs, resource allocations, and product utilization, with a focus on the primary question, "Are we asking for and getting what we need from NPRDC?" A Flag-level Steering Committee and working group was established to guide and direct the review.

Their report concluded that NPRDC's products were needed and that the Center should continue as a separate shore activity. However, they recommended several major organizational changes. As a result the Human Factors Engineering Section of NPRDC, consisting of 28 persons, was transferred to the Naval Ocean Systems Command (NOSC). Also, the management control of NPRDC was transferred from COMSPAWARSYSCOM to the Chief of Naval Personnel (CNP)/Commander, Naval Military Personnel Command (CNMPC). CNMPC was specifically charged with the direct management of NPRDC.

More Realignments

Although NPRDC's products and services were always considered needed by the Navy and the Marine Corps, management responsibility for the Center continued to move from one organization to another.

In September of 1991, the CNO disestablished the Navy Military Personnel Command (NMPC) and delegated management of NPRDC to the Chief of Naval Personnel. That same month OPNAV Notice 5450 modified the Center's mission, to

"conduct research and development to improve the performance of individuals, teams, and organizations within the Navy and Marine Corps; to provide products and services specifically directed at improving Department of the Navy personnel planning, testing, acquisition, management, and other contemporary issues; and to perform functions as directed by higher authority."

Also in 1991, the Center exhibited and demonstrated many of its research products and accomplishments at a Technology Fair in the Navy Annex, Arlington, Virginia. The Fair lasted a week and gave Navy and Marine Corps program managers an opportunity to learn more about the Center and its capabilities.

As with most military organizations, the Cold War's end and cuts in operating budgets had their impacts on the Center's R&D operations. By 1993, the Center's operating budget was one-third less than it had been in 1990. In October 1994, under severe funding constraints, NPRDC reduced its staff of 228 civilian personnel to 154 by implementing a self-imposed Reduction-in-Force.

In October 1995, the Base Realignment and Closure Commission's (BRAC-IV), recommendation that NPRDC be "disestablished and its functions realigned" became law. NPRDC's manpower and personnel research missions would transfer to Millington, TN for realignment under the Bureau of Naval Personnel (BUPERS) by FY00. The Center's training research mission was to be realigned under the Naval Air Warfare Center Training Systems Division (NAWCTSD), Orlando, and FL, in FY98.

The news about the BRAC decision was obviously difficult for employees, especially coming in the wake of the earlier Reduction in Force. The news of NPRDC's closure was buffered somewhat by the fact that the Center's R&D functions would be continuing in other R&D organizations. Employees had the option of relocating with their positions to the new locations in Orlando, and Millington.

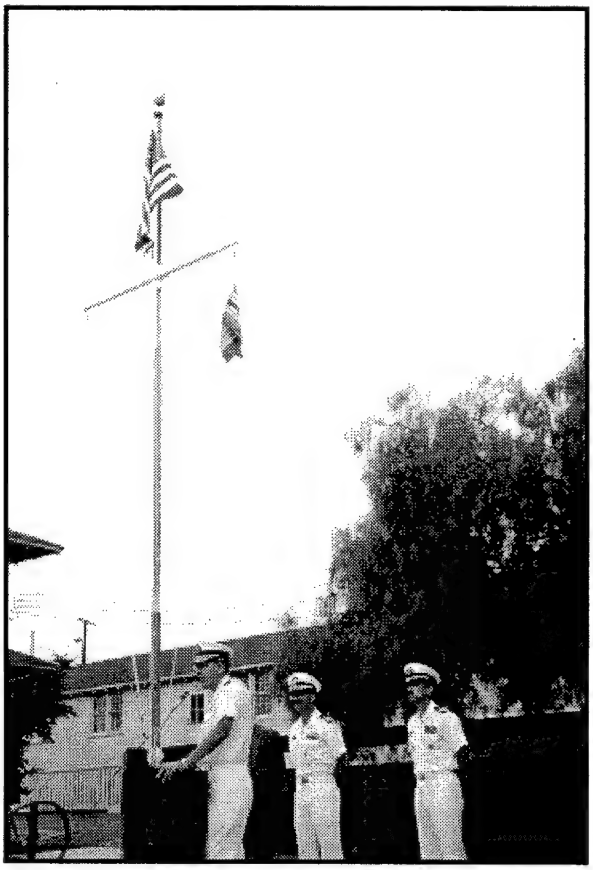
Within a few months of the news, the Center had established a Transition Office, and designated a Transition Advisor and Transition Coordinator to assist employees. Frequent All-Hands meetings were also held to address employee concerns and provide updates on management actions. Workshops were held to promote communications within the Center, and departmental committees were formed to develop plans for the transfer of functions.

Another painful event occurred in January 1997, with the death of NPRDC's Commanding Officer, CAPT Patricia Spishock. CAPT Spishock had been assigned to NPRDC the early 1980s, and she had returned to the Center fully knowledgeable of our mission and research programs. She had assumed her responsibilities quickly and energetically.

The NPRDC Library was re-dedicated in honor of CAPT Spishock on 1 December 1997, recognizing her contributions to the Center and her noteworthy career as a naval officer.

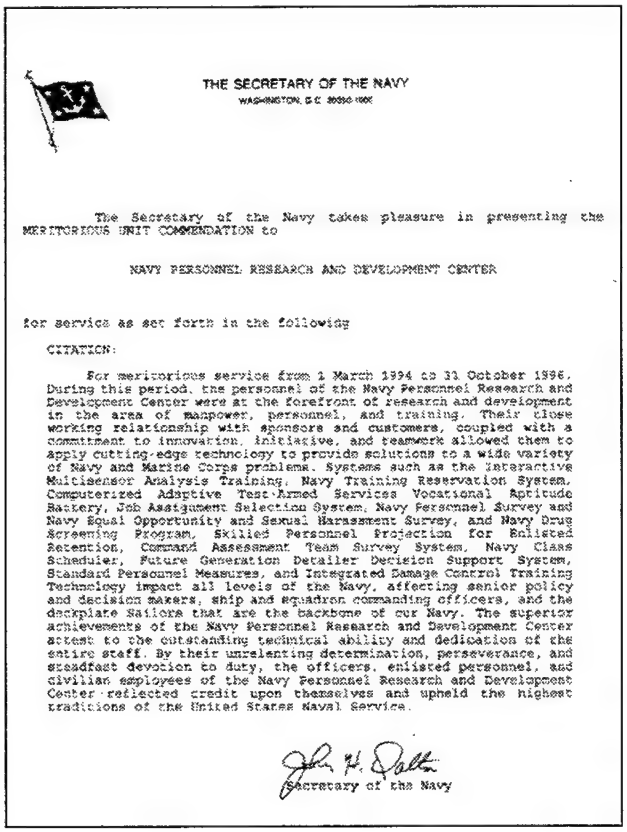
Center Wins Prestigious Award

Although the Center was operating with fewer employees and BRAC-IV's decision was fresh in everyone's minds, NPRDC continued to keep its focus on its mission, striving to create excellence in all areas. The Center's efforts were recognized and acknowledged by the Secretary of the Navy on 11 June 1998 when NPRDC was awarded the Meritorious Unit Commendation (MUC), one of Navy's highest awards given to shore-based organizations.



RADM William R. Schmidt, Prospective Deputy Chief of Naval Personnel, addresses NAVPERSRANDCEN personnel at an 11 June 1998 All-Hands Ceremony where the Secretary of the Navy's Meritorious Unit Commendation (MUC) Award was presented. The awarding and raising of the MUC flag (pictured) was part of the Ceremony.

Citing meritorious service from 1 March 1994 to 31 October 1996, the commendation states "...the personnel of NPRDC were at the forefront of research and development in the area of manpower, personnel, and training. Their close working relationship with sponsors and customers, coupled with a commitment to innovation, initiative, and teamwork allowed them to apply cutting-edge technology to provide solutions to a wide variety of Navy and Marine Corps problems."



THE SECRETARY OF THE NAVY

WASHINGTON, D.C. 20350-1000

The Secretary of the Navy takes pleasure in presenting the MERITORIOUS UNIT COMMENDATION to

NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER

for service as set forth in the following

CITATION:

For meritorious service from 1 March 1994 to 31 October 1996. During this period, the personnel of the Navy Personnel Research and Development Center were at the forefront of research and development in the area of manpower, personnel, and training. Their close working relationship with sponsors and customers, coupled with a commitment to innovation, initiative, and teamwork allowed them to apply cutting-edge technology to provide solutions to a wide variety of Navy and Marine Corps problems. Systems such as the Interactive Multisensor Analysis Training, Navy Training Reservation System, Computerized Adaptive Test-Armed Services Vocational Aptitude Battery, Job Assignment Selection System, Navy Personnel Survey and Navy Equal Opportunity and Sexual Harassment Survey, and Navy Drug Screening Program, Skilled Personnel Projection for Enlisted Retention, Command Assessment Team Survey System, Navy Class Scheduler, Future Generation Detailer Decision Support System, Standard Personnel Measures, and Integrated Damage Control Training Technology impact all levels of the Navy, affecting senior policy and decision makers, ship and squadron commanding officers, and the deckplate Sailors that are the backbone of our Navy. The superior achievements of the Navy Personnel Research and Development Center attest to the outstanding technical ability and dedication of the entire staff. By their unrelenting determination, perseverance, and steadfast devotion to duty, the officers, enlisted personnel, and civilian employees of the Navy Personnel Research and Development Center reflected credit upon themselves and upheld the highest traditions of the United States Naval Service.

Secretary of the Navy

Official letter from the Secretary of the Navy awarding NPRDC the Meritorious Unit Commendation.

The Final Years

On 1 February 1998, NPRDC's Classroom and Afloat Training R&D function was transferred to NAWCTSD. About a dozen researchers and staff transferred while others retired or transferred to other organizations in the local area.

In 1998, the Bureau of Naval Personnel completed its own BRAC-directed move to Millington, TN, and was designated the Navy Personnel Command (NPC). In July 1998, an advance party of NPRDC employees led by the Technical Director established an NPRDC satellite office in NPC. Concomitantly, the Center began actively recruiting for its new Millington organization, the Navy Personnel Research, Studies and Technology (NPRST) department. By September 1999, the staff had grown to thirty technical and support employees.

The Center's Disestablishment Ceremonies were held on 17 September 1999, concomitant with the retirement of its Commanding Officer, CDR William M. Keeney. Some 300 current and former employees and guests of the CO attending the ceremonies followed by a Farewell Dinner.

On 7 November 1999, NPRDC's Manpower and Personnel R&D functions were realigned under Navy Personnel Command (NPC) in Millington, TN. NPRDC "closed its doors" on 31 December 1999. Thus, out of its humble beginnings in two empty barracks buildings, was born the Navy Personnel Research and Development Center, an activity engaged in the full spectrum of personnel research, development, test, and evaluation.

Although the NPRST is considered a new organization, in a new home, and with new employees, it carries with it a strong legacy from NPRDC's 26 years of outstanding service to the Department of the Navy. This legacy was developed through the professional excellence of its staff, their dedication to science and to the Navy, and their energy, enthusiasm, and history of outstanding accomplishments.

NPRDC Historical Timeline

Year	San Diego, CA	Washington, DC
1945		**1946** Navy's 100,000 peacetime manpower level swells to 3.5 million by war's end. BUPERS initiates **Personnel Research Program**.
1950	**1951 Navy Personnel Research Unit**, San Diego established in two barracks buildings at present Point Loma site. Focus is on training R&D.	CNP combines personnel research into one division and calls it **Personnel Analysis Division**. Later that year he renames organization's to Personnel Research Division. **1952 Navy Personnel Research Field Activity** established in temporary quarters in Washington, DC by SECNAV.
1955		
1960		**1962** Name changed to **Personnel Research Laboratory**.
1965		
1970	**1969** Unit designated the **Navy Personnel and Training Research Laboratory** to reflect an increased R&D emphasis.	**1968** Name changed to **Personnel Research and Development Laboratory** with assigned tasks in areas of occupational research and manpower development.
1975	**May 1973** SECNAV approves establishment of **Navy Personnel Research & Development Center (NPRDC)** in San Diego. Washington Lab personnel realigned with San Diego's Training Lab. **1975** NPRDC reporting alignment changes from BUPERS to Chief of Navy Material (CNM).	
1980		
1985	**1985** CNM disestablished. NPRDC realigned under Chief of Naval Research (CNR). **1986** SECNAV changes command support responsibility from CNR to Space & Naval Warfare System Command (SPAWARSYSCOM). **1988** NPRDC reporting alignment changes from SPAWARSYSCOM to Naval Military Personnel Command (NMPC).	
1990	**1991** NMPC disestablished. NPRDC realigned to BUPERS.	
1995	**1994** BRAC-IV recommends NPRDC be disestablished and its functions realigned with its M&P R&D functions transferring to NPC in Millington, TN and its training research mission realigned under the Naval Air Warfare Center Training Systems Division (NAWCTSD) in Orlando, FL in FY97.	
2000	**1998** NPRDC's Classroom and Afloat Training function transfers to NAWCTSD **1999** NPRDC's M&P R&D functions realigned under Navy Personnel Command in Millington, TN. **31 December 1999** NPRDC disestablished.	

NPRDC Historical Timeline

PART II: NPRDC'S TECHNICAL ACCOMPLISHMENTS

Navy behavioral and decision science research and development (R&D) shares several commonalties with R&D performed in the academic and private sectors. Like those sectors, military R&D stresses the discovery of new knowledge, the quest for innovation, and the development of new technologies. At the same time, the military's people research has a unique personality unlike academic or profit-based R&D. Before examining the technical accomplishments, we review a few of these Navy-relevant research characteristics.

The Domains of Manpower, Personnel, Training, and Human Factors Engineering

NPRDC's four research thrusts resulted in a scientific workforce with a robust background of training and expertise. Manpower R&D, for example, is concerned with modeling and managing aggregates of people in the labor force. It requires professionals with training in operations research, mathematical modeling, economics, and large database design. The Personnel domain focuses on individual differences, organizational, and collective behavior, the specialization of psychologists and sociologists. Training R&D relies upon educational psychologists, subject matter experts, and curriculum development specialists. Finally, Human Factors Engineering employs scientists with backgrounds in industrial engineering, perception, and psychomotor behavior.

Of the four domains, ***Manpower*** research is the one most uniquely military because its focus is on creating and centrally managing the Navy's large workforce. Manpower planning represents the 'invisible' first step that that must be taken prior to actually recruiting applicants. Using projected requirements, new weapons platforms, and crewing needs of the future fleet, manpower planners project the size and composition of this future Navy force and estimate the resources needed to support it. The researcher exploits mathematical, statistical and operations research tools to satisfy planned requirements while maximizing the Navy's overall readiness at any given point in time. Navy manpower planners operate within budget constraints, however, and an underlying R&D theme is in "getting the most bang for the buck."

The Navy's ***Personnel*** research parallels the content of industrial-organizational psychology. Research focuses on recruiting strategies, applicant screening, selection and classification; predicting and measuring school and on-the-job performance; assessing and monitoring attitudes, morale, and job satisfaction; designing and monitoring programs aimed at improving quality of life; and examining and evaluating strategies to improve organizational effectiveness.

Similarly, Navy ***Training*** research is concerned with improving the access to, and delivery of training, enhancing the quality of education and training programs, and increasing their overall effectiveness. Training research focuses on technologies that enhance classroom instruction and on-job training, improve the acquisition and maintenance of technical skills, increase knowledge acquisition, retention, and job proficiency, and improve the overall quality of instructional technologies.

Human Factors Engineering (HFE), a component of NPRDC's mission during its first 15 years, examines the interactions between the working environment, hardware, equipment and the human operator. This discipline includes job design and all situations in which humans interact with machines, such as interfaces with weapons systems, control panels, or graphics displays. Human Factors scientists are also concerned with assessing human sensory and motor performance and determining how factors such as stress, boredom, or ship's motion affect human performance.

Behavioral and Decision Sciences Research Methods

The Navy is not only a dynamic organization, but also one that must fulfill a diverse range of mission requirements on a daily basis. Each command's operating schedule (OPTEMPO) has very little leeway for variations and all crewmembers are involved in supporting the operating schedule. As a result, opportunities for using laboratory paradigms—where experimental and control subjects might be treated differently—are extremely limited. There is an implicit "not to interfere" restriction imposed on R&D efforts by the Fleet and, as a result, people-related science R&D in the Navy tends to be more observational than manipulative in nature. This restriction challenges the ingenuity of military researchers when designing research projects.

At the same time, people-related R&D in the military has at least two advantages over R&D conducted in other settings:

Use of Longitudinal Designs. Cohort groups can be followed over extended periods of time with a

high degree of accuracy. The military is a relatively 'closed system' and individuals can be tracked and contacted over the course of their service careers. As a result, longitudinal studies usually have fewer complications than those done in civilian settings.

Access to Subjects, Sample Sizes. Sample size—often a major problem for researchers in academic or industrial settings—is less likely to be an issue when designing and conducting military R&D. Research projects involving only a small number of participants are comparatively rare. Subject participation or compliance in research projects, while voluntary within the Privacy Act's protections, also tends to be higher than found in civilian research settings.

Results Orientation

Civilian research, particularly in academic settings, is often justified on the basis of advancing the 'state-of-the-art.' Military research, in contrast, must be justified on the basis of whether or not it advances the 'state-of-the-military.' As a result, Navy people-related R&D is usually applied, practical, and results-oriented.

On the surface some people-related research projects "seem to go on forever." The fact that military jobs change, military applicants vary over time, new technical skills are required, and the Navy itself is evolving all contribute to the need for continuing research. In fact, if some R&D projects were to end, the Navy would soon find itself with outdated and inadequate tools to meet its people-related needs.

Technologies

Military R&D is best described as being applied and low-risk. *Invention*—discovering new principles and technologies—takes second priority to *Innovation*—applying or exploiting new knowledge or technologies. With regard to NPRDC, basic research funds—monies targeted to discovering new knowledge or technologies—were extremely limited and represented only a small fraction of the annual operating budget.

It should also be pointed out that about 40 percent of the Center's funding over its lifetime was from 'reimbursable' monies. Reimbursable funds come from a sponsor's operating budget—monies intended for operations and maintenance. As a result, reimbursable efforts are often aimed at developing or adapting existing technologies to meet specific sponsor needs and requirements. Reimbursable projects have a strong likelihood of success, lead to tangible products, and are completed in a relatively short time (2-3 years).

The Center benefited from having a strong base in reimbursable funding not only because of customer satisfaction but because the efforts themselves often identified issues and problems requiring more extensive and in-depth investigation using longer-term research monies.

Political Environment

Meta-level issues, national priorities, and the associated defense posture serve as underlying drivers for the military's major research programs and projects. R&D priorities shift as political parties and sentiments shift. At the peak of the Cold War, and with President Reagan's goal of a 600-ship Navy, there was a substantial influx of enlistees and officers needed to crew these new commands. Center R&D efforts during the 1980s examined strategies and technologies for:

- Improving the delivery and availability of training to large numbers of personnel;
- Developing manpower tools for managing a larger military force;
- Selecting and assigning large numbers of personnel; and,
- Social issues such as substance abuse, race, and gender integration.

In comparison, the end of the Cold War gave impetus to research into downsizing, productivity improvement, "doing more with fewer resources," and developing a force able to meet such varied mission requirements as peacekeeping, drug interdiction, and counter-terrorism.

Summary

The Navy conducts a wide spectrum of hardware and systems-oriented R&D. NPRDC's mission focused on R&D in Manpower, Personnel, Training, and Human Factors Engineering. It aimed to improve the effectiveness of individuals, teams, and organizations within the Navy and Marine Corps. Taken in totality, the program was results-oriented, focused on applying evolving technologies, and aimed at solving recognized military problems. The Center's research funding and priorities reflected the National Defense Strategy coupled with the Navy's own strategic plans and doctrine.

As might be expected, the single technology that most influenced R&D over the course of NPRDC's lifetime was the computer—initially large mainframe computers; later, the personal computer (PC); and still later, networked PCs and the World Wide Web.

Some of the efforts in the last 15 years were aimed at upgrading the capabilities of earlier research products to incorporate advances in computer, network, and web technologies. Advances in allied technologies, including expert systems, neural networks, mathematical modeling, data mining, discovery systems, electronic simulations, and satellite transmission served as focal points for further exploration.

THE NEW ORGANIZATION BEGINS

In January 1973, the Paris Peace Accords brought an end to the costly and controversial war in Vietnam. The war brought with it problems of drug abuse, racial discord, and strong antiwar sentiments. The image of the military had strongly eroded among the nation's youth and "peace" demonstrations had occurred on college campuses throughout the nation. The All Volunteer Force—the end of the peacetime draft—began that year as Defense Department and Navy managers faced the prospect of meeting recruiting quotas from a population of young men who were less than enamored with the role of the military.

The Navy, usually strong on tradition, had made several major changes in its people policies as a result of growing anti-war sentiments among sailors. The Chief of Naval Operations, Admiral Elmo Zumwalt, had issued a series of Z-Grams that recognized the need to accommodate and manage social change while maintaining military readiness. Many of these changes were embodied in an emerging Human Goals Program.

Finally, the Navy was five years into history's largest and most intensive military social experiment, "Project 100,000." Initiated as a part of President Johnson's War on Poverty, each of the services had inducted 15-17% of their recruits from among applicants failing to meet accepted minimum aptitude standards. The armed services were tasked with training and preparing these individuals for meaningful civilian jobs at the end of their two-year enlistments.

NPRDC began operations in its new San Diego home in July 1973. By December, the Center had in place its new Commanding Officer, CAPT James Clarkin, and new Technical Director, Dr. Jim Regan. The new organization had also begun establishing its identity, creating its management structure, and allocating its professional resources.

NPRDC'S PRODUCTS

From its beginning NPRDC's major strengths were in the areas of training; manpower; personnel testing, selection and classification; and personnel surveys. The Center represented a community of scientists, sharing ideas, skills, knowledge and energies in solving human resources problems. The talents of its researchers and their interactions led to synergies in how projects were proposed and conducted.

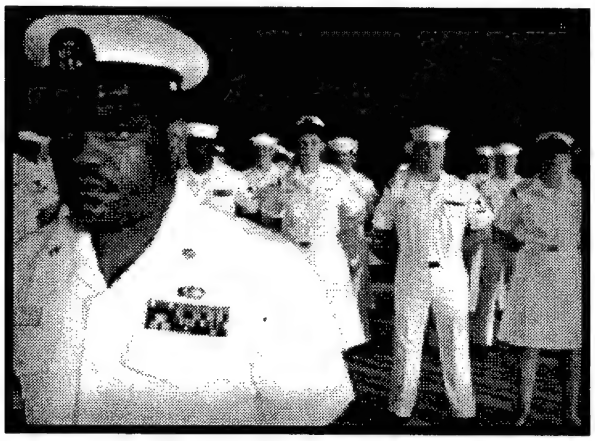
Over its 25 years, NPRDC conducted over 800 separate and discrete R&D projects, an average of 32 new efforts each year. Space doesn't permit a complete enumeration or accounting of the Center's accomplishments over its 25+ years of research excellence. Nor can we list the program directors, project leaders and team members whose visions and contributions led to the research products.

What follows then is a sampling of research programs that typify the Center's long-range history of innovations and scientific contributions. The products are representative of the broad spectrum of research undertaken, and exemplify the Center's support for Navy and Marine Corps claimants and sponsors. Many efforts were evolutionary in developing technologies, enhancing them, and applying these innovations to other military problems. While NPRDC went through several reorganizations over its lifetime, with projects shifted among departments and divisions, the research maintained its programmatic character.

MANPOWER

Over its history, a substantial portion of NPRDC's overall R&D program was devoted to force management. The Navy is the most advanced of the four services in using scientific manpower planning and decision making, in large part because of the NPRDC manpower research program. The program extended the Navy's capabilities for forecasting manpower supplies; predicting force losses over a horizon of several years; determining and reducing personnel costs; more effectively managing incentives; and, optimizing the match between human resources and job requirements.

The military is unique in how it fills job vacancies. While civilian organizations may advertise and recruit applicants for positions from outside the organization, the same isn't true for the military. Instead, the personnel structure of the military is based almost exclusively on upward mobility. This means that persons at the very highest salary levels (paygrades) have gotten that far by working up from the bottom. Nearly all members of the enlisted force, irrespective of their seniority, began their careers as recruits—the first rung of the career ladder.



This career development system creates unique problems, especially when an unexpectedly large number of people with seniority decide to leave the Navy—as happens when the private sector economy is doing well and outside jobs are plentiful. When this loss of leadership occurs, the military cannot recruit mid- or senior-level personnel replacements. Instead, it must advance more people from lower pay levels. Manpower researchers develop models to predict future personnel losses by occupational fields, identify qualifications for personnel in some 70 different occupations and nine paygrades, and forecast the future availabilities of recruits who will meet these occupational qualifications.

Finally, each Navy command is in a constant state of personnel turbulence, with crewmembers and officers rotating in and out of positions on cycles of 2-3 years. The rate of personnel turnover in Navy commands averages 30 percent each year, a rate far higher than in most civilian organizations. Personnel rotation creates its own domain of management issues and problems, ranging from ways to minimize the costs of relocations, to identifying suitable upcoming job vacancies for persons rotating out of their present jobs, to balancing an individual's time-at-sea with his or her time in shore assignments. Manpower R&D also encompasses the distribution, assignment and rotation of active duty personnel.

As might be expected, there is an ongoing need to assess and analyze the entire manpower planning system, not only because of its complexity but because problems within one set of system components can affect the performance of other components.

Manpower Modeling

NPRDC and its predecessor laboratory in San Diego was a pioneer in developing and implementing mathematical models for manpower planning. The first such model, the Advancement Planning Model (ADPLAN), was developed in 1965 for use on the Navy's mainframe computers. The model calculated the monthly number of enlisted advancements for Petty Officers in some 200-skill communities. ADPLAN was actively used for 25 years and was replaced by a PC version of the same model in 1990. The success of this and related models led to an increased R&D program of manpower modeling that revolutionized the Navy's manpower planning and forecasting capabilities. We describe a few of the specialized applications in the approximate order they were developed.

Navy Personnel Pay Predictor-Enlisted (NAPPE). The NAPPE Model forecasts the enlisted force structure based on historical longevity rates. Since the Navy's budget for enlisted personnel has always been its single largest cost item, more accurately predicting the configuration of the enlisted structure equates to realizing substantial savings. As little as a one-percent error represents an over-expenditure of almost $30 million annually. NAPPE successfully reduces errors in pay projections from one percent to less than one-tenth of one percent.

Skilled Personnel Projection for Enlisted Retention (SKIPPER).

Enlisted Community Managers (ECMs) in the Navy Personnel Command are responsible for maintaining appropriate numbers of enlisted personnel within their assigned ratings and skill communities. To do this they must be able to accurately assess the current and future inventory of enlisted personnel in their designated ratings and skill communities under various policy scenarios.

SKIPPER forecasts the effects on personnel inventories of changes to school input school loading, school attrition, and/or selective reenlistment bonuses (SRBs). SKIPPER can provide projections by fiscal year and length of service for up to 8 years into the future.

The SKIPPER models provide a uniform, consistent platform for developing all enlisted community inventory projections, school plans, retention plans, and advancement plans. The models yield improvements of from 10-50 percent in forecasting capability, depending on rating and tenure, and can develop plans and assess policies in a matter of minutes rather than hours or days.

Budget Obligation & Tracking System (BOATS). Each year the Navy spends about $18 billion to compensate its active duty military personnel. As with most large organizations compensation funds are received at the beginning of the fiscal year for the entire 12-month period. It becomes imperative to accurately monitor how funds are spent and to compare planned vs. actual monthly

spending levels. These functions are performed separately for over 100 pay and allowance categories (called entitlements), each composed of numerous subcategories.

The Budget Obligation & Tracking System (BOATS), developed by NPRDC, performs this arduous monthly accounting task. It automatically forecasts the amount of 'rollback' incurred by the Navy each month in various budget categories. Because BOATS enables budget analysts to determine financial obligations for military pay and allowances more accurately, over-obligation of funds is significantly reduced. The use of BOATS has enabled the Navy to avoid the over-obligation of compensation (MPN) funds by an estimated $17-25 million annually.

Officer Force Management. Two NPRDC-developed tools nicknamed **STRAP-O** and **OPIS** are used to develop officer inventory and loss forecasts, promotion and accession plans, and assess a wide range of personnel policies for each officer designator. Both STRAP-O and OPIS were used in the early 1980s to support the Navy's growth to 600 ships; then again a decade later to assist in the officer inventory drawdown. The systems yield improvements of from 20-50 percent in inventory forecast and losses forecast accuracy and enable developing plans and assessment of policies in minutes rather than hours or days.

Enlisted Strength Planning. A recent development is the Navy Enlisted Strength Planning (NESP) System, which consists of a family of models that forecast a variety of personnel gains, losses (including retirement, attrition, and expiration of active obligated service), and retention actions. The output of the models is the main input to the Navy's official Enlisted Strength Plans. These plans are used to target the recruitment, reenlistment, and advancements for some 300,000 sailors.

Although NESP has resulted in a variety of improvements, the main ones are forecasting accuracy and capability. Regarding accuracy, NESP halved the error rate formerly experienced by Navy planners. In terms of capability, the NESP models have enabled planners to test alternatives in early retirement policies, varieties of separation policies, and the effects of recruit mix on trainee losses, among others.

Distribution Modeling

NPRDC had an ongoing R&D program that addressed the assignment and distribution of personnel and positions within the Navy. The earlier modeling programs were nicknamed **EPANS and CEDAD**, and both eventually evolved into the **Job Advertisement and Selection System (JASS).** The most recent project was **Assignment Policy Management System (APMS),** which will be continuing at the new **Navy Personnel Research, Studies and Technology (NPRST)** Department in Millington. When completed the APMS will provide a decision support system designed to determine the tradeoffs of assignment policy goals, optimize effectiveness of detailing, and assist in the execution of the detailing process.

Job Advertising and Selection System (JASS). For several years, the vast majority of Navy enlisted personnel assignments have been made by negotiation between detailers and sailors over the phone. Every sailor has a "detailer story"—what went right and what went wrong in negotiating a new assignment. This is an inefficient process because sailors often make hasty decisions based on the few choices their detailer offers at that time over the telephone.

This first-come-first-served process is not the best one for detailers to use either. Decisions made on any one day may be driven by who calls, and what is available, rather than by who is best for the job. Detailers also have to deal with multiple and conflicting Navy personnel policies in attempting to balance service needs with sailors' preferences.

JASS is an innovative addition to the Navy's enlisted assignment system that improves the efficiency and effectiveness of decision making. JASS is an on-line information and decision system for both sailors and detailers. Sailors around the world can now gather information about possible job "vacancies" and even apply for desired jobs on-line. JASS integrates knowledge gained from NPRDC distribution research projects and innovations made feasible by the World Wide Web and electronic communications

Since being introduced in 1996, JASS has proved to be such a success that the Naval Reserve Force has adopted it. JASS enables detailers to do their jobs better while giving sailors a more informed opportunity to select their next job assignment. JASS currently handles over 15,000 job vacancies occurring each month.

Information Systems

Although advances in manpower modeling have helped transform the way the Navy manages its human resources, advances in computer technology have been equally dramatic. As with modeling, NPRDC pioneered many novel uses of computers. For example, as early as 1977, NPRDC developed the Navy's first executive level information system

(called DELIS). This system consisted of a variety of databases and models that the top management of BUPERS could query to answer questions arising in the course of executive discussions. Note that this development preceded the advent of PCs and the Internet by a decade. NPRDC had a long history in exploiting computer resources to enhance the interface between manpower planners and their models, between models and their databases, and between users and their databases. Some of these efforts are described below.

Navy Drug Screening Program (NDSP) and Navy Drug Web (NAVDWEB). The Navy's success with its zero tolerance drug use policy rests on an effective urinalysis program and other drug detection components. All Navy commands participate in the urinalysis program and a key to its usefulness lies in periodic, random testing of all personnel for illicit drugs. Unfortunately, procedures for ensuring "randomness" are often inadequate. One possible result is that a savvy drug user might learn the command's testing schedules and avoid detection.

NPRDC researchers developed a series of mathematical procedures that assure persons being tested through urinalysis are randomly selected. What remained was an easily understood interface that enabled each command to follow its randomized testing procedure. The Navy Drug Screening Program (NDSP) is a standalone PC based program that provides that interface. Its random selection and timing algorithm provides the needed deterrent factor to eliminate gaming opportunities while improving the accuracy and efficiency of the overall drug-testing program. Fewer than 1% of the personnel tested positive out of 800,000 persons tested in FY98.

Another component of this information system is the **Drug Information Presentation Manager (DIPM)**. It serves as a centralized and easily accessible source of historical information on drug related data. It enables commands to monitor trends and perform self-assessments within the unit while helping the Navy carry out its zero tolerance policy.

The third component of this Drug Information effort takes advantage of the pervasiveness and access availability of the World Wide Web. In line with the Navy's "Right Spirit" campaign, NPRDC designed and developed the **Navy Drug and Alcohol World Wide Web (NAVDWEB)** Site. NAVDWEB provides accurate centralized information for Drug and Alcohol Program Managers, Advisors, and any sailor wishing to obtain information or help. Since coming on line in 1998, NAVDWEB has hosted over 20,000 visitors.

Defense Acquisition Workforce (DAWIA) Management Information System (MIS). The Defense Acquisition Workforce Improvement Act (DAWIA) of 1990 requires the development of a Management Information System (MIS) for the acquisition workforce. Managing and monitoring acquisition personnel and positions within the Navy and Marine Corps Officer and Civilian personnel systems is, in itself, a challenging task.

An information system—the DAWIA MIS, developed by NPRDC, helps the Assistant Secretary of the Navy (Acquisition) successfully identify, monitor, and train the Navy's acquisition workforce. The DAWIA MIS also generates complex status reports on the workforce, as mandated by Congress. The DAWIA-MIS contains a detailed career history database on all officers, enlisted, and civilian members of the acquisition workforce. The database reflects each individual's prior experience, education, and training. This information is used for determining future training needs and in making assignments.

The MIS provides users with quick and easy access to current information, helps manage acquisition workforce resources, provides the capability to evaluate alternative workforce policies, and serves human resource offices, training representatives, and acquisition workforce members.

The DAWIA MIS includes a World Wide Web based reporting system that extends access to standardized reports, and includes an ad hoc query/analyses capability for use by human resource personnel and training representatives in the field. In addition, a voice mail job referral system enables acquisition workforce job vacancies to be advertised nationwide.

Recruiting Systems

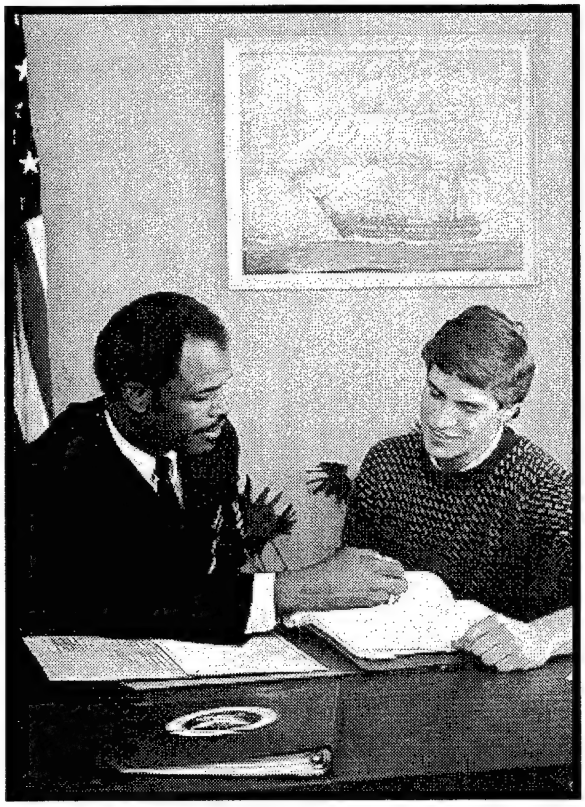
Thousands of Navy recruiters throughout the country are responsible for locating, contacting, and contracting/selling the Navy to 50,000 potential recruits a year. In a time of decreasing defense funds, the Navy must find a way to increase recruiter productivity while restraining costs. NPRDC's support for Navy recruiting extends over two decades and includes a broad spectrum of research products.

In the late 1970s, microcomputers (later to become known as personal computers) were beginning to offer significant processing power at an affordable price. This powerful tool provided the platform for the Navy Personnel Accessioning System (NPAS). Designed to assist the Navy Recruiting Command and recruiters in the field, NPAS supported four automated functions at Navy Recruiting Stations: (1) individualized testing (aptitude and interests), (2) vocational guidance, (3) assignment prediction, and (4) management support. The first three functions assisted Navy recruiters in

matching recruit applicants to available jobs, while the fourth function provided office automation capabilities to facilitate applicant processing.

Previous efforts developed selection criteria for recruiters, identified personal and situational factors affecting recruiter performance, and developed workshops aimed at improving recruiter productivity, more effectively managing time, and reducing job-related stress.

More recent efforts spanned the domains of manpower planning and forecasting, coupled with tailored information systems that present information in forms readily understood by recruiters in the field.



Recruiting Information Delivery System (RIDS). RIDS brings together an extensive collection of existing recruiting management data (e.g., demographic and economic conditions, educational status, recruiting production) with software that uses the stored data to generate additional data (e.g., rates, frequency counts) "on the fly."

RIDS includes interactive software that summons requested data quickly and displays it in either graphic or tabular form. RIDS reduces analysts' dependence on their own and other organizations programming staffs. Besides providing badly needed data for other recruiting R&D efforts, RIDS served as the software platform for several recruiting planning models.

The strides made in developing RIDS and recruiting planning models led to research that will be continued at the NPRST.

Training Reservation System

The Navy operates training facilities in approximately 400 different locations. An estimated 350,000 students attend one or more classes every year. The scheduled training time can range from one day to more than 6 months. The Navy has problems associated with its training reservations management. Outdated and incompatible computer systems lack the ability to exchange information needed to maintain accurate class reservation information. This incompatibility contributes to unintentional under- and over-booking, resulting in tens of thousands of empty seats and missed training opportunities.

A related problem is in time lost between when students arrive for training and classes actually begin. The Navy's systems also resulted in over one million man-days (approximately 5000 man years) wasted as students either awaited instruction or awaited transfer after completing a phase of training.

The Navy Training Reservation System (NTRS) and **Navy Training Quota Management System (NTQMS)** apply airline industry booking technology adapted to Navy training management. NTRS provides access to on-line reservations Navy-wide, so schoolhouses have accurate projected class rosters. It also provides detailers with accurate class schedules and quota availability. NTRS improves training management and resource utilization by automatically tracking reservations, quotas used, and student "no shows."

Both the NTRS and NTQMS are now in operation. Full use of these operational systems is projected to reduce the number of students awaiting classes by 15% and unfilled seats by 25%, improving fleet manning and readiness by 195,000 man work days per year. Other efficiencies include immediate per diem cost avoidance of $2.5 million and annual savings of $14.5 million in end-strength authorization costs.

NPRDC's efforts in manpower modeling, forecasting and force management highlight another characteristic shared by several projects—programmatic and continuing support for the same R&D sponsor. As research products were developed and delivered, follow-on projects were undertaken, often to take further advantage of new technologies, and often to investigate and develop research solutions to other sponsor issues and problems.

PERSONNEL

Officer Selection

One of NPRDC's longest running projects has been in the area of Naval Officer Selection, which addresses selection to both the Naval Academy and NROTC programs. The project can be traced to the 1960s when improved aptitude tests were developed for officer candidate selection.

By the early 1970s, it became evident officer selection could be improved even further by including vocational interests in the selection composite. The early work focused on identifying "successful" officers and developing and validating keys to the Strong Vocational Interest Blank (SVIB) for identifying candidates matching the successful officer profile. The SVIB[3] is a commercially available interest measure that is widely used for vocational guidance and counseling. The new Naval Officer keys for the SVIB were added to the other selection measures and resulted in greater validity for selecting the most promising officer candidates.

An important key to sustaining the usefulness of selection measures lies in continued monitoring and evaluation of their effectiveness. An early part of the Center's work with the Naval Academy was to design a system for routinely collecting information on every candidate—selection test scores, high school grades, interest profiles, interviewer ratings, and grades earned at the Academy. This feedback system enabled researchers to monitor the long-term effectiveness of the selectors and continually improve their overall usefulness to the Academy.

In the mid-1970s, the Naval Academy set a goal of increasing the proportion of midshipmen with science and engineering majors from 65 to 85 percent. Using their historical files, NPRDC researchers studied midshipmen characteristics associated with success in the physical sciences. They recommended changes in the selection measures that resulted in a 15 percent increase in midshipmen with science and engineering majors and an 11 percent decrease in overall class attrition.

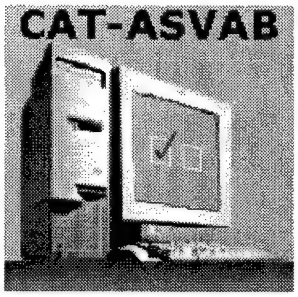
Tests and Measurements

Another area of long-term support has been in tests and measurements. This includes a broad spectrum of paper-and-pencil and computer-administered instruments to assess an individual's aptitudes, skills, and intellectual characteristics. Navy jobs vary in both the kinds and levels of skills they require. Accurate measures of each individual's capabilities are vital to accurate selection and classification.

Armed Services Vocational Aptitude Battery (ASVAB). The Center's contributions to the original paper-and-pencil version of the Armed Services Vocational Aptitude Battery (ASVAB) began in the mid-1960s when the San Diego laboratory participated on a DoD task force to improve enlisted selection to the services. At that time all services relied on the Armed Forces Qualification Test (AFQT) to determine enlistment eligibility. Each branch then re-tested incoming recruits with their own selection tests in order to apply their own selection criteria for training and occupations. DoD reasoned that it would be a more effective process if a single instrument were used for screening applicants and assigning recruits to each services' occupational fields.

The earliest versions of the ASVAB were pilot-tested across the services in 1966. After several revisions and administrations the new ASVAB was turned over to each of the services in the early 1970s. By 1973, NPRDC was engaged in research to map ASVAB scores to the old Basic Test Battery (BTB), and develop Navy specific norms for its incoming recruits.

A second major effort involved validating the ASVAB against grades earned in the Navy's Class "A" Technical Schools, to (1) determine its predictive validity, and (2) establish ASVAB selection criteria for some 90 occupational fields. Concomitantly, a more global vision was being forged to computerize the ASVAB administration and automate the entire entry process from recruiting through assignment using emerging computer technologies.



CAT-ASVAB. NPRDC's development of the Computerized Adaptive Test version of the Armed Services Vocational Aptitude Battery (the CAT-ASVAB) represents a textbook case of how a new technology is identified, investigated, and applied to solve military needs. CAT-ASVAB was the product of research in cognitive testing, applied computer technologies, and decision sciences. It is one of the most significant contributions NPRDC has made to the Navy, DoD, and industry.

[3] The SVIB was revised in the 1980s and is now called the Strong-Campbell Vocational Interest Inventory.

Fully operational in mid-1997, CAT-ASVAB is the first large-scale, computerized adaptive testing program in the world. It saves the DoD over $3.5 million per year, testing nearly all military applicants in half the time with greater flexibility, security, and standardization of administration.

CAT-ASVAB represents a major leap forward in personnel testing by using computers to administer the tests. It reduces academic attrition, provides immediate test scores, and makes the entire process of selecting and admitting military applicants much more efficient, a crucial competitive edge in today's tough recruiting market. Moreover, applicants find the computerized tests more interesting and motivating than traditional paper-and-pencil instruments.

Many beyond DoD are benefiting from the Center's CAT research coupled with collaborative research by the Educational Testing Service (ETS). The Department of Labor, the Immigration and Naturalization Service, and ETS used the CAT-ASVAB model in developing their own tests. CAT-ASVAB changed the way we do business in selecting and classifying applicants, making recruiters, instructors, and Navy leaders more effective. The Office of the Assistant Secretary of Defense (Personnel and Readiness) sponsored the Joint Services CAT-ASVAB program. The Department of the Navy was the Executive Agent, the Navy was the Lead Service and NPRDC was the Lead R&D Laboratory.

Innovations in Testing. Throughout its history NPRDC researchers have monitored ongoing cognitive testing research to identify promising new instruments that potentially could add to the predictive value of existing tests. The program designed, constructed, administered and validated tests involving dynamic motion, spatial reasoning, personality constructs, and biopsychometrics measures.

The biopsychometrics research program investigated how brain wave measures relate to the successful on-the-job performance. The target populations included sonar and radar equipment operators, and personnel assigned to jobs requiring vigilance, attention to detail, and sustained concentration. Another focus of investigation was Marine Corps marksmen and brain wave pattern changes that occurred as personnel improved their skills to the expert marksmen level. The biopsychometrics research provided insights into the dynamics of brain processes underlying complex task performance, suggested new domains for personnel selection, and led to two patented methodologies for measuring individual differences.

Selection and Classification

During the 1960s, the availability of mainframe computers enabled Navy personnel researchers to examine fairly complex mathematical models for assigning recruits to technical schools and their first duty stations. The model, Computer Assisted Assignment System (COMPASS) made use of a transportation algorithm which minimized travel costs while maximizing the match between student aptitudes and each schools entry requirements.

COMPASS was later replaced by the Personalized Recruiting for Immediate and Delayed Entry (PRIDE) system. PRIDE offered improved capabilities for matching assignments while also considering each recruit's preference for schools or duty stations. Further advances in computing during the 1980s enabled developing Classification and Assignment within Pride (CLASP), the present assignment system. CLASP itself will be replaced by an even more sophisticated assignment technology as an R&D project at the new NPRST organization is completed.

Personnel Surveys

A major strength 'inherited' from the Washington Laboratory was in the area of personnel surveys. As noted in the following sections, the Center relied on several different types of surveys to assess social issues and quality of life factors.

One survey, however, the Navy-wide Personnel Survey (NPS) was NPRDC's single longest-running survey program, having begun in the late 1960s. The NPS provided BUPERS planners and program managers with salient information about personnel initiatives and policies while also being sensitive to emerging issues and trends.

By the early 1970s, however, there was a proliferation of surveys being administered in the fleet and local commands. Often the same individuals were being asked to complete several different surveys over a short timeframe (and to the detriment of their time on the job). As a result the CNO suspended all personnel surveys and tasked NPRDC to develop uniform guidelines for survey development and administration in the Navy.

In 1975, the new system termed CCOPS (for Coordination and Control of Personnel Surveys) was delivered to the CNO. It designated NPRDC as the central clearinghouse for all Navy surveys, and issuing a CCOPs Control Number to all surveys approved for administration. Under the new directive the Center provided technical expertise to agencies planning surveys while exercising quality control over surveys approved for administration.

One criticism of the NPS—that it involved "too many people and too much time," was also addressed by developing sampling strategies that yielded statistically reliable and valid results using only about 5% of the enlisted force for a given administration. This improvement led to the survey's gathering high quality information with minimal disruption to the fleet.

Social Issues and Quality of Life

As noted earlier, the Navy was five years into history's largest and most intensive military social experiment, "Project 100,000," at the time the Center was established. The Vietnam War surfaced an increasing problem with illicit drug use.

The Center's efforts in social issues research are among the longest running at NPRDC. The first projects began in 1966 with Project 100,000, a DoD-wide program to enlist and train applicants who were previously below acceptable standards for entering the service.

The Navy's increasing awareness of social problems within its force led to the eventual integration of several separate initiatives under a single umbrella in 1973. This new Human Goals Program focused on Drug and Alcohol Abuse, Race and Ethnic Relations, Leadership, and Overseas Diplomacy. By 1976, its scope was expanded to include a Navywide program of organizational development, termed, Human Resource Management (HRM)

Human Resource Management (HRM). NPRDC was the focal point for both research and coordination in support for the Human Resource Management program, which operated from 1973 through 1984.

One of the Center's earliest efforts in support of HRM involved Overseas Diplomacy. NPRDC's work focused on two critical areas: (1) problems encountered, and engendered, by U.S. sailors while on liberty in foreign ports, and (2) the increasing number of service members and their families who were returned home prior to completing overseas assignments.

After conducting interviews and focus groups, the Center's researchers concluded that both issues were training problems. Sailors needed an orientation and information concerning both the laws and customs of foreign countries they would visit, and so did those personnel (and their families) who would be stationed overseas.

Several training tools were developed for use by ships calling at foreign ports. These included brochures specific to each foreign port, language cards that contained key phrases for getting around, and all-hands presentations to prepare sailors on what to expect, things to do, and places to avoid.

Similar orientation materials were prepared for families scheduled to be stationed overseas. Family members also participated in a game-like simulation, BAFA, BAFA, which involved them in the dynamics of being in a strange country. Interestingly, BAFA BAFA is now being used as a training tool by international countries sending executives and their families overseas—an excellent example of technology transfer for a Center R&D product.

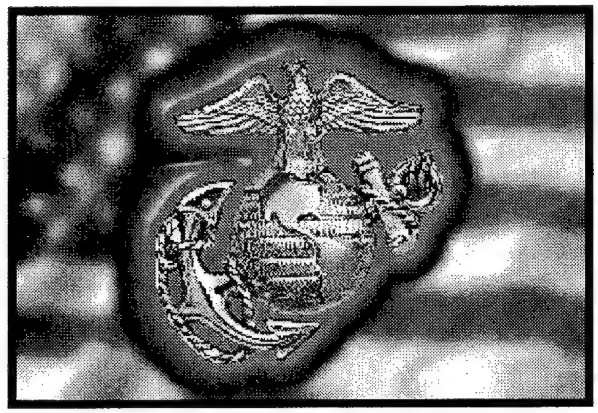
The organizational development component of the HRM program evolved from ONR-sponsored research at the University of Michigan based on survey-guided development. The Navy's program required that all operational units participate in HRM Surveys along with follow-on organizational development activities; a cycle which repeated every 18 months.

NPRDC developed and maintained the HRM Survey, an instrument designed to measure organizational climate within a command as well as social issues—race and ethnic relations, substance abuse, and gender integration. Responses to the HRM Survey were stored in a database on a dedicated computer located at the Center. The database eventually contained information from over 650,000 survey respondents. This large body of information enabled developing norms for specific types of commands and groups of respondents. With them, commands could assess their progress in managing human resources and identify potential problems that might impact readiness.

The HRM database became a vehicle for establishing correlations between survey responses and command outcome variables. For example, the HRM Survey demonstrated statistical and practical significance for predicting rates of reenlistment, Non-Judicial Punishments, Naval Status of Forces (readiness) ratings, and performance in refresher training. Four studies evaluated the impact of the HRM program by comparing units that had participated in HRM development activities vs. control units that had not. These showed that commands participating in HRM interventions experienced significance increases in unit readiness, reenlistment rates, and performance during refresher training.

Another key innovation was the establishment of a Wide Area Network hosted by NPRDC's dedicated computer and managed by the HRM research team. This HRM Information Network (HRMIN) enabled e-mail and data exchange among 13 HRM Centers

and Detachments worldwide, the BUPERS program sponsor, and NPRDC.



Marine Corps Quality Of Life (QOL). Quality of Life (QOL) factors may influence a variety of military outcomes, ranging from job satisfaction to reenlistment. While most policymakers and managers agree on the importance of QOL, there is little consensus as what factors constitute and contribute to QOL. Several questions also arise with respect to Quality of Life services offered in the military. What type and level of QOL services should be offered? How, and where, should we provide them? Who will benefit most from them? Are the costs for these programs returned in terms of eventual savings for the military services?

One of NPRDC's earliest QOL projects was conducted in the late 1980s for the Marine Corps. The research examined a wide spectrum of QOL factors and determined their relationships to three outcomes—readiness, retention and performance. A 2nd phase addressed the design of an assessment system that can be used to evaluate the impact of QOL programs.

Perhaps the most immediate question is whether there is a link between QOL factors and military personnel outcomes—does QOL play a role in military effectiveness? That answer is, "yes." The Marine Corps results verified that there were significant relationships between QOL services and retention, performance, and readiness.

The findings of this research have important implications for both military and civilian QOL programs, since we also explored which target populations benefit from different kinds of QOL services. For example, childcare services are very important to married or single parents while health and gymnasium facilities tend to be used most often by younger, single people.

Pulse Point. Another important aspect of quality of life rests in military welfare, recreation (MWR) and personal care (childcare, for example). These services are important to service personnel. Pulse Point is a computer-based customer satisfaction survey system implemented Navy-wide in October 1998. This new tool enables Family Service Centers and Military Welfare and Recreation facilities to monitor their own clientele in terms of services used and needed, which are most in demand, and which need improvement. NPRDC's research team also established a Pulse Point web site as part of the Navy's MWR web page, and will provide ongoing support and software updates using web technology.

The development of Pulse Point was made feasible by earlier Center research involving computer-administered surveys. The system, referred to as CENSUS, made use of a computer terminal connected to a central computer that was used for administering surveys. CENSUS had the capability for providing timely, accurate information when quick turnaround surveys were needed. Its associated cost and access problems were not overcome, however, until desktop computers became widely available.

Gender and Diversity

NPRDC has been conducting research on gender integration for over two decades and the results of these studies have been applied throughout the Department of Defense. The program addresses long-term management concerns as well as immediate issues raised as the Navy aims toward an integrated workforce.

The primary objective of the **Gender Research Program** was to enhance gender integration while maintaining readiness. The Center worked hand-in-hand with Bureau of Naval Personnel managers for over 25 years in both anticipating and resolving issues involving gender integration and sexual harassment.

NPRDC pioneered the application of survey technologies to the study of equal opportunity and sexual harassment issues. These assessments enable Navy program managers to monitor the effectiveness of policies and programs, while alerting them to potential issues that need to be addressed in their program planning.

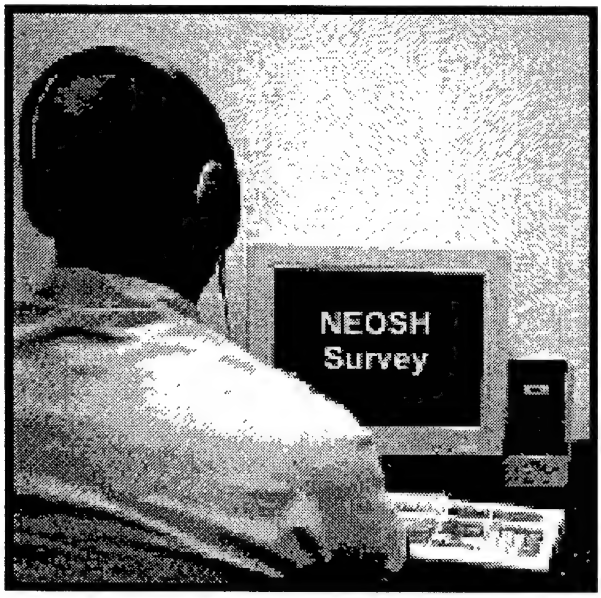
A mainstay of the current program is the **Navy Equal Opportunity and Sexual Harassment (NEOSH) Survey**, which is administered every two years. NEOSH Survey results are used to monitor and improve EO Programs and are briefed to the Navy's top managers, including the Chief of Naval Operations, the Chief of Naval Personnel, and the Undersecretary of the Navy. The most recent findings

show that these programs are having the desired results.

The launching of the Navy Hotline for reporting sexual harassment incidences was a direct result of NPRDC's gender research. Other studies have led to policies that opened ratings to women, enabled assignments to ships, and ensured fairness in performance evaluations. Center researchers are recognized for their eminence and expertise on gender and diversity, and have served on DoD, Navy and Presidential Committees concerned with women and minorities. They also have participated in International conferences focusing on gender and diversity.

Productivity Enhancement

NPRDC's productivity research began in 1976, when the Center initiated a broad R&D program



focusing on worker motivation and performance.

Working with supervisors and employees in six Navy shipyards, NPRDC designed, installed, and evaluated a performance-based incentive system for keypunch operators.

Another early effort identified impediments to productivity and involved in-depth interviews with headquarters managers to identify organizational barriers affecting their work performance. Those findings served as an impetus for several Navywide productivity conferences and NPRDC's establishing a robust R&D program addressing organizational assessment, diagnosis, intervention, and readiness.

The Center also operated an experimental productivity laboratory in the 1980s to examine the effectiveness of various strategies for improving worker quality, output and satisfaction. Several reward schedules were examined and the most effective were later prototyped at maintenance activities on the West Coast and Hawaii. The program addressed strategies for managing worker incentives, using performance-contingent reward systems, and enhancing team performance. The emerging principals set forth by Edward Deming were also adapted to the Navy's industrial activities. In fact, the term *Total Quality Management (TQM)* was coined by an NPRDC researcher.

The success of the TQM research program led to the Navy's creating Total Quality Leadership Centers on the East and West Coast in the early 1990s. Several of NPRDC's organizational researchers transferred to these TQL offices at that time to support this new initiative. During the 1990s, the Center's organizational effectiveness R&D focused on readiness assessment, including criteria that could be used as Measures of Effectiveness (MOEs).

Education and Training

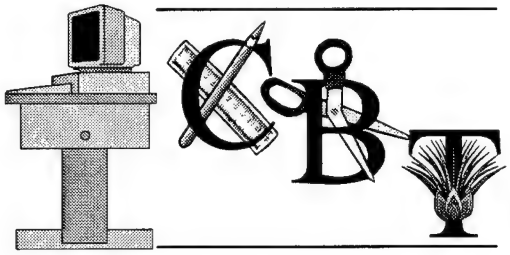
The Center's training research program provided a strong research foundation for both the Navy and Marine Corps. The program addressed a broad spectrum of research issues ranging from curriculum development and standardization to foreign language training, leadership development, and several forms of automated instruction.

During the 1980s NPRDC established a fully equipped portable classroom on wheels that could be stationed alongside ships for delivering specialized training and studying the learning of complex skills. Another successful product, termed *Batman and Robin,* was widely used for training officers in tactical decision making. This interactive computer simulation was strongly grounded in both theoretical and empirical research, despite its arcade game-like name.

Job-Oriented Basic Skills Training (JOBS)

When NPRDC opened, the Training research component had already established itself as a premier R&D laboratory under its Director, Dr. Earl Jones. Some of NPRDC's earliest training projects were carried over from the late 1960s research involving Project 100,000 enlistees. They included piloting of courses in remedial reading, introducing and evaluating the usefulness of several job performance aids, and Job-Oriented Basic Skills Training (JOBS).

The JOBS research developed job performance aids for four occupational communities. The underlying concept behind the JOBS training was to compensate for skill deficiencies of lower aptitude personnel, so they could successfully complete Navy technical school and perform to fleet standards. Subsequent evaluations of JOBS trainees indicated that the program was highly successful in meeting its goals and providing the Navy with an alternative technical manpower source.



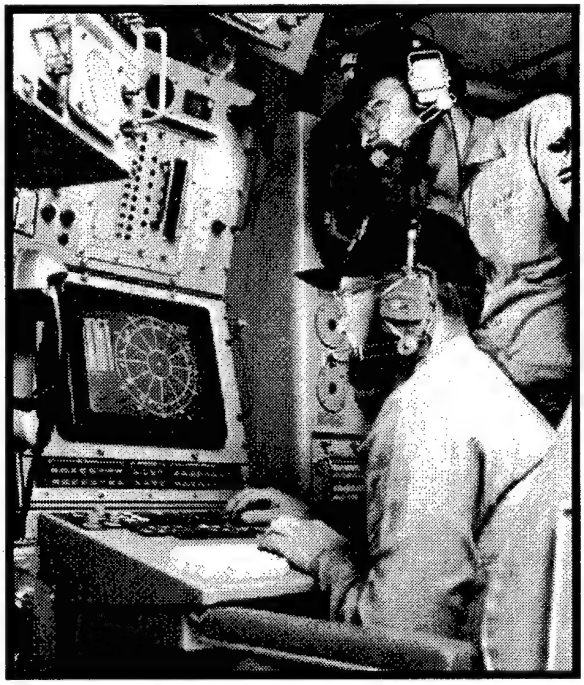
Computerized Training

Advances in computer-based training systems were in the earliest stages of development at the time NPRDC began operating. In the ensuing years researchers investigated how these emerging technologies could to be applied to Navy training and training management. Other research investigated low-cost simulations of complex training systems, automated authoring systems for computer-based instruction, and video distance training systems.

In **Computer Assisted Instruction (CAI)** a computer terminal (and later a personal computer) serves as the delivery system for instructional materials. A major effort during the mid-70s examined the use of CAI strategies in the Basic Electricity and Electronics (BE&E) School in San Diego. Pilot work involved PLATO IV, a mainframe computer-based training system installed at the University of Illinois, Urbana. The Center accessed PLATO IV through a series of remote terminals located at the BE&E School and Point Loma. Those findings led to the installation of a stand-alone IBM 1500 system at the BE&E school and a comprehensive examination of instructional strategies, evaluation and revision methods, and the bottom-line effectiveness of this new automated approach to training.

The project represents one of the most complete and best-documented tests of early computer-based instruction. Key findings were that computer students scored higher than class-instructed students on both the regular school exams and the supplemental tests, while the computer based training took only one-half the training time of traditional class instruction. Students also liked this promising new type of training and expressed a preference to receive 70-80% of their instruction via computer.

In **Computer Managed Instruction (CMI),** the computer serves as administrative manager for such matters as trainee scheduling, test grading, and student feedback. A complete CMI system was implemented at the aviation technical training command in Memphis for three courses: BE&E, Aviation Fundamentals, and Aviation Machinist Mate. At the time this was the largest CMI tryout in the world, involving some 6,700 students daily and an annual student throughput in excess of 66,000 students. The foundations for this system sprang from research supported by ONR in collaboration with NPRDC researchers. The work represented a premier example of research visions in military CMI training becoming operational realities.



Maintenance Training

Simulators are a mainstay of Navy technical training, particularly when complex and costly equipment is involved. Simulators themselves are often quite costly and substantial savings can be made using lower-cost alternatives, such as two-dimensional computer displays with interactivity to replace expensive simulators.

NPRDC's research on computer simulations traces to the early 1980s. The projects examined a variety of maintenance and operator training by simulating equipment, electronic warfare training, videodisc threat training, basic skills remediation,

and reduced attrition at the Naval Training Command by providing instruction in study skills centers

Those efforts led to several products, including training in electronic equipment maintenance, radar operations, and use of an automated maneuvering board. STEAMER simulated a ship steam plant so students could rapidly see the result of changes to the steam system. The Automated Maneuvering Board allowed students to understand the maneuvering board by presenting true and relative views in motion. These systems yielded results indicating that students gained equivalent skills over equivalent periods of time, but at far lower cost, using the low-cost simulations.

In 1984 several of these maintenance products were highlighted in displays at the rotunda of the Senate Office Building in Washington, DC. The purpose of the demonstrations was to inform senate staff members of opportunities for technology transfer and ways that workers could be retrained to use emerging technologies.

Authoring Instructional Materials (AIM)

Training and education in the Navy is a costly undertaking that is very labor-intensive. In a typical year, some 300,000 enlisted personnel are involved in formal training. Developing and revising the instructional materials needed to train these students is an ongoing process.

The Authoring Instructional Materials (AIM) project developed automated systems for designing, developing and producing instructional materials for conventional and computer-delivered courses. AIM provides military instructional developers with a suite of computer-based tools that reduces the time, effort, expertise, and costs for producing high-quality instructional materials. AIM was implemented in 1990 and AIM sites reported that the time needed to design, develop, produce and maintain curriculum materials was reduced by 20 to 50 percent using the new system.

Automated Classroom

AIM's capability for tracking cross-references in technical documentation and providing an audit trail for training requirements led to follow-on research on the Paperless Classroom and Automated Classroom projects. The product of these efforts was a paperless version of the Instructor Guide (IG) used by classroom instructors. The system provides classroom instructors with a computerized set of programs for personalization, visual aids, and video and computer-graphics displays that are cross-referenced in the IG. AIM is now fully implemented and being administered through its own program office at the Naval Air Warfare Center Training Systems Division in Orlando, Florida.

Joint Staff Officer Training (JSOTS)

The Joint Staff Officer Training System (JSOTS) provides training to prepare newly assigned Joint Chiefs of Staff Action Officers quickly and competently to assume their duties. Prior to adopting JSOTS, new action officers usually required over six months on the job in order to get "up to speed." Their responsibilities cover a wide range of defense planning and operations, have considerable economic, political and diplomatic consequences, and are often extremely sensitive.

JSOTS shortened this on-the-job learning period considerably, by providing job-specific information and context to all newly assigned officers during their first week on the job. JSOTS was the first major application of interactive training technologies (e.g. computer-based and interactive-video) to the training of high-level professional skills for mid-career officers.

Distance Training

A common theme of the 1990s is "doing more with less" and this is particularly true for Navy training. The task is to provide a wide spectrum of technical courses to both active duty and Reserve personnel with fewer instructors, fewer classrooms, and fewer travel dollars. NPRDC researchers turned to Video Teletraining (VTT) as a promising, emerging technology that could overcome some of these restrictions on the delivery of quality training.

NPRDC established a VTT research laboratory in 1990 and conducted a series of studies to determine under what conditions VTT was most effective. They examined what types of interactivity were needed between instructors and students, what kinds of materials lend themselves to video presentation, and how to provide hands-on training to students in remote classrooms. As a result of this research, VTT is now routinely used for both lecture and laboratory Navy courses. VTT student achievement is similar to students in traditional classrooms, while training costs were cut to one-half of their previous levels.

Anti-Submarine Warfare Training

NPRDC researchers also worked with the Commander, Anti-Submarine Warfare Wing, Pacific, to develop an effective and efficient instructional program for the Navy's carrier-based ASW weapons systems. Much of the training used advanced

Computer Assisted Instruction (CAI) techniques and led to cutting training costs by some $10 to $20 million annually while student performance was increased.

The ASW research program extended over two decades and included projects on shipboard mine hunting sonar, the use of on-site microprocessors for delivering core training in passive acoustic analysis; examination of an integrated undersea surveillance system, surface ship sonar training and advanced acoustic analysis training. Interestingly, this long-term support for ASW enabled the eventual fusion of this cumulative body of research from undersea warfare, and from computer maintenance simulations, into a highly sophisticated training simulator for representing underwater properties and interactions, referred to as IMAT.

Interactive Multisensor Analysis Trainer (IMAT). IMAT replaces conventional rote memorization drills with advanced scientific visualization techniques that give even the most junior operator a deep understanding of ocean dynamics, acoustics, and tactics. IMAT draws upon an extensive database that enables instruction and mission rehearsal in any ocean environment, under any weather conditions, and at any time, against a variety of threats.

The scientific breakthrough achieved by IMAT is the unique combination of high quality, physics-based models, databases, and simulation of the ocean environment. The system is being used in all Aviation Warfare Operator (AW), Submarine Sonar Technician (STS) and Surface Sonar Technician (STG) "A" Schools, as well as at tactical training sites. IMAT allows students to experience a "what if" environment in the classroom, while quickly and effectively seeing the effects of their decisions. Learning is more rapid and more complete. Evaluations of the system show a 40 percent increase in problem-solving skills among apprentice operators.

HUMAN FACTORS ENGINEERING

Human Factors research develops programs to advance and support the interaction between individuals and increasingly complex hardware systems. Human factors engineering (HFE) includes the social, technical, and physical environments in which humans operate. NPRDC's program was aimed at enhancing the quality of performance and improving working life. Ultimately, of course, this resulted in improving retention and readiness.

Many of the Center's HFE research projects were done in collaboration with Navy R&D hardware laboratories as they planned new equipment and systems. NPRDC researchers helped design the new hardware platforms, ensuring that human factors considerations were taken into account during the earliest 'drawing-board' stages. They also examined manning requirements to establish skill requirements and the number of operators needed with new hardware and equipment. Below are a few of the HFE research projects that were undertaken prior to the program's transfer to another R&D laboratory in the late 1980s.

Shipboard Manning. The Shipboard Manning project was a collaborative research effort involving NPRDC and the David W. Taylor Naval Ship R&D Center. The effort comprised two research projects designed to reduce the manpower needed for a ship's crews. These innovative research projects changed the nature and context of two traditional Navy jobs. Tryout aboard several experimental ships demonstrated significant savings in manpower requirements and enabled planners to reduce manning requirements.

Minehunting Sonar. Baseline human engineering requirements were established and procedures were developed for operating minehunting sonar in a ship environment. Researchers examined ways of maximizing visibility on sonar displays, types of visual cues operators needed to recognize and discriminate mines and non-mines, types of skills needed to do an effective job, and the technical training that was needed to prepare operators for the new system.

Computer-Assisted Fault Detection System. Firemains on ships are high-pressure water delivery systems located throughout a ship, used to extinguish fires. Because they operate at high pressure, they occasionally rupture, resulting in flooding, damage, and the loss of firefighting capabilities. The *Fault Detection System* provided automated monitoring of ruptures, and like an alarm system, it alerted personnel immediately when problems were detected.

The fault detection system was just one of several projects undertaken in support of the DDG 51's introduction to the fleet. NPRDC researchers provided preliminary and contract design support for the DDG 51's combat, hull and machinery systems.

Non-Tactical Shipboard Automated Data Processing (ADP). NPRDC investigated current and proposed ADP systems from a human factors perspective. This ensured that the man-machine interface was not only effective but provided opportunities for embedded training, skill adaptation, and tailoring to individual users. The new interfaces were prototyped and tested on-site before being installed on several ships and carriers.

Visitor Data Automation System. Visitors to ships and shore installations must be screened through a manual process involving logbooks and files for clearances. NPRDC researchers reasoned that this entire process could be automated by adapting computer technologies. *The Visitor Data Automation System* is a stand-alone product that accesses clearance data, visit requests and the purpose of a visit. It expedites coming 'on board,' a ship and ensures that the right points of contact are ready to escort their visitors.

NPRDC's human factors researchers also played an important role in working directly with ships and commands experiencing operator problems with hardware, equipment, and platforms. Center scientists frequently boarded ships, observed operators on-the-job, made performance measures, and provided recommendations to improve the efficiency of the human-machine interface and operator performance.

NPRDC established a *Fleet Support Office (FSO)* in 1984 to maintain an active liaison with the staffs of fleet, type and systems commanders. Building upon the 'Human Factors' fleet experience, the FSO kept commanders advised of what services and products were offered. The Office also acted as a sounding board between the operating forces and the scientific community.

May 1973 to December 1999

NPRDC: A Research Community

People are a key component in every Navy system and this was especially true for NPRDC. At its peak in the 1980s the Center employed 340 civilians and 30 military personnel, a small staff compared to most of the Navy's R&D laboratories. Of the civilians, about two-thirds were scientists and technicians in the fields of psychology, education, mathematics, statistics, operations research, economics, and computer science.

The support staff matched the caliber of NPRDC's scientists and provided both in-house support services and ready access to outside resources. Over its 26-year lifetime, NPRDC conducted over 800 separate and distinct projects and many of these research products remain in use today. Other products became the basis for further development and improvements as technologies evolved and greater efficiencies could be realized. NPRDC's products were the result of cr5eativity, inspiration, innovation and a dedicated cadre of individuals working together for the betterment of the Navy, Marine Corps, and Department of Defense.

NPRDC's Manpower and Personnel R&D functions were transferred to the Navy Personnel Research, Studies, and Technology (NPRST) division of the Navy Personnel Command (NPC) on November 7, 1999. One of the Center's major products during its final year was "Sailor 21," an integrated agenda for future research in manpower and personnel

Although NPRDC had developed several long-term research plans over its lifetime, Sailor 21 departs from its predecessors by examining future manpower and personnel requirements as derived from Navy and DoD requirements and strategic planning documents. Sailor 21 provides a comprehensive, although not exhaustive, science and technology vision for "Navy people," while providing a more detailed picture of what can be realized in the future. There are six R&D components to Sailor 21.

- Recruiting
- Selection and Classification
- Personnel Planning and Policy Analysis
- Distribution and Assignment
- Knowledge Management Systems
- Personnel Surveys and Program Evaluation

Each R&D component outlines the desired future state of affairs, then outlines how a sustained, well organized, and properly resourced research program can achieve those ends. Taken in its entirety, Sailor 21 represents a "Revolution in Military and Business Affairs" regarding Navy personnel.

The visions outlined in Sailor 21 have been well received within the Navy's top management and scientific communities as well as by the other military services. With sufficient funding and support, Sailor 21's visions for the future may become realities.

APPENDIX A

Previous Commanders and Technical Directors

APPENDIX A

PREVIOUS COMMANDERS AND TECHNICAL DIRECTORS

WASHINGTON LABORATORY			
Commanders		**Technical Directors**	
CDR Richard P. Draine	(Jul '52 - Dec '54)	Mr. Edward J. Ryan	(1954-1964*)
LCDR Harry S. Graves	(Jan '55 - Mar '56)		
CDR Myron Alpert	(Apr '56 - Mar '57)		
LCDR Wayne P. Ramay	(Mar '57 - 'Mar '60)		
LCDR Joseph V. Pavela	(Mar '60 - May '61)		
CDR Clayton F. Johnson	(May '61 - Jun '64)		
CDR Kathryn Dougherty	(Jun '64 - Jul '65)	Mr. George Burgess	(1964 - 1967)
CDR Cecil O. Williamson	(Jul '65 - Jan '69)	Mr. Eugene Ramras	(1967 - 1973)
CDR Karl E. Kuehner	(Jan '69 - Jun '69)		
CRD Roy E. McCoy	(Jun '69 - Oct '71)		
CAPT Alva L. Blanks	(Dec '71 - Jul '73)		
SAN DIEGO LABORATORY			
CAPT William M. Lowry	(Feb '52 - Nov '54)	Dr. Edward Dudek	(1952 - 1971)
CAPT Severance W. Gavitt	(Nov '54 - Nov '57)		
CAPT J. Dunham Reilly	(Nov '57 - Jan '61)		
CDR Harold B. Boaz	(Jan '61 - Jun '64)		
CDR George W. Watson	(Jun '64 - Jun '69)		
CDR Karl E. Kuehner	(Jun '69 - Jul '72)		
CAPT Frederick L. Nelson	(Jul '72 - May '73)	Dr. Earl I. Jones	(1972 - 1973)
NPRDC			
CAPT Frederick L. Nelson	(May '73 - Dec '73)	Mr. Eugene Ramras	(Feb - Sep 1973)
CAPT James J. Clarkin	(Dec '73 - Aug '78)	Dr. James J. Regan	(Sep '74 - Aug '82)
CAPT Donald F. Parker	(Aug '78 - Aug '80)		
CAPT James F. Kelly, Jr.	(Aug '80 - Jun '83)	Dr. James W. Tweeddale	(Aug '82 - Feb '87)
CAPT John W. Renard	(Jun '83 - Jan '85)		
CDR John E. Kohler	(Jan '85 - Oct '85)		
CAPT Howard S. Eldredge	(Oct '85 - Jun '86)		
CAPT Barton E. Bacon III	(Jun '86 - Jan '91)	Dr. James S. McMichael	(Jan '87 - Feb '90)
		Dr. Richard C. Sorenson	(Feb '90 - Jan '94)
CAPT Thomas F. Finley	(Jan '91 - Nov '92)		
CAPT Jack D. McAfee	(Nov '92 - Oct '94)		
CAPT Patricia M. Spishock	(Oct '94 - Jan '97)	Murray W. Rowe	(Feb '94 - Dec '99)
CDR William M Keeney	(Jan '97 - Sep '99)		

*Mr. Ryan's title was Chief Scientist. In July of 1964 the Chief Scientist's title was changed to Technical Director.

NPRDC COMMANDING OFFICERS

CAPT Frederick L. Nelson
May 1973 - Dec 1973

CAPT James J. Clarkin
Dec 1973 - August 1978

CAPT Donald F. Parker
July 1974 - August 1980

CAPT James F. Kelley
August 1980 - June 1983

CAPT John W. Renard
June 1983 - January 1985

CDR John E. Kohler
January 1985 - October 1985

CAPT Howard E. Eldridge
October 1985 - June 1986

CAPT Barton E. Bacon, III
June 1986 - January 1991

CAPT Thomas F. Finley
January 1991 - November 1992

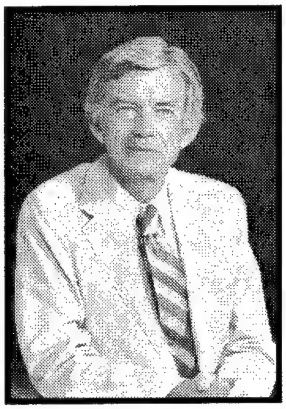
CAPT John D. McAfee
November 1992 - October 1994

CAPT Patricia M. Spishock
October 1994 - January 1997

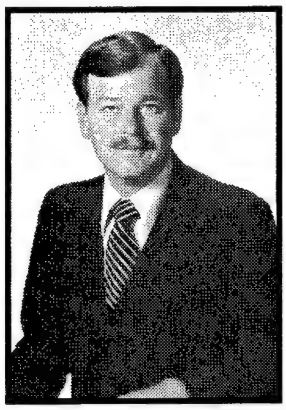
CDR William M. Keeney
January 1997 - December 1999

NPRDC TECHNICAL DIRECTORS

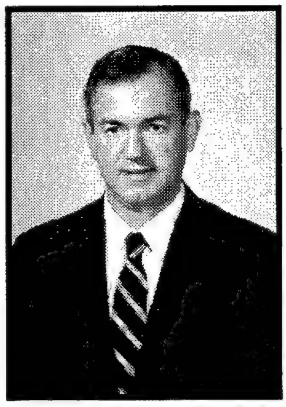
Eugene M. Ramras (Acting)
February 1973 - September 1973



Dr. James J. Regan
September 1973 - August 1982



Dr. James W. Tweedale
August 1982 - January 1987



Dr. James S. McMichael
January 1987 - February 1990

Dr. Richard C. Sorenson (Acting)
February 1990 - January 1994

Murray W. Rowe
February 1994 - December 1999

APPENDIX B

NPRDC's Plank Owners: Employees at the Time of Establishment

NPRDC'S PLANK OWNERS:
EMPLOYEES AT THE TIME OF ESTABLISHMENT

Norm Abrahams
Al Abrams
Macy Abrams
Ed Aiken
Ed Alf
Emy Alhambra
Adolph Anderson
Richard Anderson
Alvin Archibald
Gloria Asher
David Atwater
John Balaban
Betty Baughman
Carole Beckett
Chuck Bigsby
Chester Bilinski
Robert Boller
Norman I. Borgen
Sam Bowser
Claude Bronstein
Laurie Broedling
John Brock
Michelle Brooks
Lavon Buckley
Raymond E. Cady
Vic Camp
Stuart Carson
Elizabeth Chanin
Dave Chesler
Chuck Childs
Rocco Cicchetti
James Coady
Alan Copeland
Chuck Cory
Marge Covher
Kent Crawford
Roberta Crum
Ervin Curtis
Rachel Dalton
Joyce Dann-Mattson
Frank Digialleorardio
Thomas Duffy
Kathleen Durning
Burl Ellis
Jim Emery
P-A Federico
Bela Feher
Michelle Ferro-Czech
Paul Foley
John Ford
Patricia Fredericks
Paula Frederick
Georgia Garrett
Richard Gaylord
Earl Genton
Bill Githens
Roger Goldberg
Ted Graham
Ida Harloff
Robert Harrigan
Robert Harris
Gordon Hatfield
Myron Hillman
Charlie Hodges
Gene Hooprich
Rick Hurlock
Elmer Hutchins
Duane Johnson
Helen Johnson
Kirk Johnson
Earl I. Jones
Leona Jones
Aaron Katz
Carrie Kelley
William A. King
Fran Kloack
Ernie Koehler
Adolph Koran
Harold D. Kribs
George Lahey
Orv Larson
Al Lau
Nicoletta Ling
Marge Logan
Norman Lonsdale
Paul Magnusson
Ray Main
Vern Malec
John Malone
Bill Marten
Clyde 'Bud' Maxey
Patricia Miller
Bill Montague
William Montague
William Moonan
Ramona Mouzon
Patrick McCann
Kay McCoy
Hulett McDowell
Marie McDowell
Joseph McLachlan
Carolyn McLandrich
Adie McRae
Joseph Myer
Nancy Neffson
Bea Neher
CAPT Frederick Nelson
Idell Neumann
Richard Newman
Lee Norton
Paul Nowell
Hal Oas
Joe Offir
Halim Ozkaptan
Keith Parker
Robert Panell
Mary Pasquarallo
Betty Peterson
Lois Peyric
Edward Pickering
Len Pollack
Louis T. Pope
Kenneth Purdy
Bernie Rafacz
Teddy Ralph
Gene Ramras
James J. Regan
Bob Rhea
Bernie Rimland
David Robertson
Alexander R. Robins
Gene Rocklyn
Hal Rosen
Marge Royle (Taylor)
Vanessa Ruple
Linda Sabol
Phyllis Sallop
William "Drew" Sands
Bill Sarati
Del Sass
Anthony Sassano
John Saylor
Harvey Schow
Hazel Schwab
Mel Schwartz
Howard Short
Joe Silverman
Allan Sjoholm
Dewey Slough
Bea Smith
John Smith
Margaret Smith
Wayne Smith

Robert Sniffin
Mannie Somer
Richard C. Sorenson
Marta Spencer
Walt Spencer
Lloyd Standlee
Jim Stapleton
Gene Steadman
John Steinemann
Hervey Stern
Gene Stichman
William Stinson
Pavio Stuart
Roy Suiter
Jean Sullivan
Len Swanson
Walt Thode
Edmund D. Thomas
Robert P. Thorpe
Patricia J. Thomas
George Tice
Sandra Van Beenen
Donald Van Kekerix
Nick Van Matre
Sam Ward
Jim Warrington
Robert Waters
Mary Townsend
Sandra Van Beenen
Marsha Towers
Don Van Kekerix
Nick Van Matre
Sam Ward
Jim Warrington
Robert Waters
Wayne Watkins
Steve Wax
Paulette Weir
David Wedding
Robert Wells
Betty Whitehill
Gerry Wilcove
Herm Williams
Robert Willis
Jimmy D. Winchell
Marty Wiskoff
John Wolfe
Patricia Wonders
Porter Wooten
Anna Worth
Ted Yellen
Juanita Zweiban
Robert Zweibel

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Commander, Navy Personnel Command (NPC-00), (NPC-05)
Chief of Naval Operations (Historian)
U. S. Naval Historical Center, Washington, D.C. (6)
Defense Technical Information Center (DTIC) (2)